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NORTHWESTERN HAWAIIAN ISLANDS BOTTOMFISH FISHERY, 1994

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OVERVIEW OF THE FISHERY

The 1989 federal limited entry plan for the Northwestern Hawaiian Islands (NWHI)(Fig. 1) bottomfish fishery has stabilized fishing effort in terms of the number of vessels fishing within the designated limited access *Ho'omalu* zone. Fishing effort within the open access *Mau* zone, however, continues to fluctuate.

The National Marine Fisheries Service (NMFS) estimates that 1994 NWHI landings totaled 444,000 pounds, surpassing the annual landings totals of the previous 5 years (Tables 1 and 2). Trips in 1994 made reached a 5-year high of 140, and the number of vessels fishing increased from 12 in 1993 to 16 in 1994.

The number of vessels fishing the *Ho'omalu* zone (the limited access area) increased by one vessel to five in 1994. The average number of trips per vessel remained unchanged at eight per year, while total *Ho'omalu* zone catch declined slightly. The *Ho'omalu* zone vessels continued the 1993 trend of fishing farther up the NWHI portion of the Hawaii Archipelago in an attempt to locate more productive fishing areas.

The *Mau* zone (the open access area) participation increased by 4 vessels over 1993 to 12 vessels. The bottomfishing vessels based on Kauai have slowly reentered the fishery after being put out of commission by Hurricane Iniki in September of 1993. In the interim, many of the fishermen had been repairing their vessels while taking advantage of land-based construction jobs.

The catch for the *Mau* zone has increased for the past 3 years. The average number of trips per vessel remained unchanged while fishing effort, in terms of total number of trips, increased (Table 3).

During 1994, catch within both areas fluctuated by species. The largest fluctuations occurred within the *Mau* zone where the uku (grey snapper)[1] landings increased 549%, the onaga landings increased 136%, and other bottomfish management unit species (BMUS) landings increased 152%. Large fluctuations in uku landings are typical of this species. These large increases in the *Mau* zone landings reflect a 63% increase in catch for all species combined. Catches of the *Ho'omalu* zone target species remained rather flat with no dramatic increases or decreases. The largest increase, 58%, was seen in the Other BMUS category.

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[1] Scientific names are listed in Table 4.

The ongoing problem of predation on hooked fish, primarily by sharks (Carcharhinidae) and to a lesser extent by dolphins (*Tursiops* sp.), continued throughout 1994. Monk seals, *Monachus schauinslandi*, although present much of the time, were only infrequently implicated. Levels of catch predation remained variable, with heavily fished areas continuing to have an abundance of predation while other less-fished areas had little or none.

FLEET OPERATIONS IN THE NWHI

General Fleet Operations

Twenty-seven permits were issued during 1994 (compared to 35 permits in 1993), of which 16 vessels fished (Fig. 2). Seven *Ho'omalu* permits were issued in 1994, of which two were newly "grandfathered." Of the seven permittees only five *Ho'omalu* zone vessels actively fished, compared to five permits and four active vessels in 1993. Twenty permits were issued for the *Mau* zone of which 12 vessels were active (30 permits, 8 active vessels in 1993).

Two sets of 1994 NWHI vessel activity and catch-per-trip information are listed in Table 5. One is based on a NMFS sample, which accurately reflects the operations of the Oahu-based fleet, and the other is based on a combination of NMFS and Hawaii Division of Aquatic Resources (HDAR) data. This data base includes landings from Kauai-based vessels that could not be directly monitored by the NMFS, as well as additional HDAR data for the Oahu-based vessels. However, the HDAR data do not provide the level of fishing effort detail obtained in the NMFS sample.

Sixteen individual vessels made 140 trips throughout the NWHI (Table 5, Fig. 2). The fleet averaged 8 trips per vessel while the number of trips for an individual vessel ranged from 1 to 14. The areas fished ranged from Nihoa Island to Nero Bank. Average trip length, based on monitoring, was 18 days with 8.5 days of fishing (n = 49 trips) compared with 13 days with 7 days of fishing (n = 90 trips) in 1993.

Comparisons of trip operations and landings by management areas for 1991-94 are shown in Table 6. For consistency, these results were based only on NMFS-monitored data (data prior to 1991 are entirely NMFS figures).

Of the 16 active vessels, 6 fished on a regular basis (12 active vessels, 7 on a regular basis in 1993)--2 vessels in the *Mau* zone and 4 vessels in the *Ho'omalu* zone. There was one *Mau* zone vessel that received a *Ho'omalu* zone permit during the year. One *Mau* and 2 *Ho'omalu* zone vessels concurrently held longline

limited entry permits while 1 *Ho'omalu* vessel held a NWHI lobster permit.

Ho'omalu Zone Fleet Operations

Five vessels fished the *Ho'omalu* zone, only four of which fished regularly. Forty one trips were made, with an average of 8 trips per vessel (Table 3, based on NMFS-HDAR data). The number of trips made per vessel ranged from 3 to 11, and the areas fished ranged from French Frigate Shoals to Nero Bank. The majority of the fishing activities were centered in the Maro Reef to the Northampton Seamounts area.

The average trip lasted 22 days, with 11 days of fishing. The average trip length increased by 2 days as the number of days fished (Table 6) remained unchanged. Although fishermen traveled a greater distance to find productive fishing grounds, the catch decreased, and the fishing days per trip remained unchanged. While effort, in terms of total days fished by the fleet, has increased, the revenue per trip and the annual revenue per vessel have decreased.

Mau Zone Fleet Operations

The number of vessels fishing in the *Mau* zone increased during 1994; 12 vessels made 99 trips (NMFS-HDAR data). One vessel from Kauai and 1 from Maui fished the 1994 season on a regular basis. Fishing effort decreased 7% within the *Mau* zone (Table 6). Fishing trips to the *Mau* zone averaged 10.8 days with 6 days of fishing. The fishing area encompassed the entire *Mau* zone.

BOTTOMFISH LANDINGS DATA

General NWHI Landings

The NWHI fleet landings are jointly monitored in Honolulu by personnel of the Fishery Management and Economics Program (FMEP) of the NMFS Honolulu Laboratory and the HDAR. The majority of the landings are monitored at the largest seafood auction in Hawaii, where the majority of the fish caught by the large-scale, full-time commercial bottomfish fishery are sold.

The total bottomfish landings for the NWHI increased to a 6-year high (Tables 2 and 7, Fig. 3). The average NWHI landings for all species per trip (NMFS-HDAR data, Table 5) were 3,679 pounds, 125 pounds less than 1993 landings. BMUS accounted for 85% of the total landings (1993 = 94%), and BMUS landings per trip averaged 3,137 pounds. BMUS catch per trip in the *Mau* zone rose 19% while *Ho'omalu* zone catches dropped 17% (Table 3, NMFS-HDAR data).

Species landings composition by weight for the NWHI is provided in Table 7 and by zones in Table 8. Opakapaka landings were the highest followed by uku, hapuupuu, and butaguchi. Onaga, Other BMUS, ehu, and other bottomfish made up the remainder of the landings.

Opakapaka landings (Fig. 4), usually the largest component of the catch, decreased by 8%. The decrease is reflected by a per-trip drop in landed pounds of 40% for the *Mau* zone and 22% for the *Ho'omalu* zone.

Uku catches made the largest gains during 1994, rising 136% overall to become the second most common species with 78,000 pounds in landings volume compared to 1992 when 86,000 pounds were landed. On a per-trip basis the increases correlate to a 372% increase for the *Mau* zone while the *Ho'omalu* zone decreased by 15%.

Ho'omalu Zone Landings

Ho'omalu zone BMUS landings were down by 1.4%. Opakapaka landings were the highest (Fig. 5B) followed by hapuupuu, onaga, butaguchi, uku, Other BMUS, and ehu. The *Ho'omalu* zone average landings per trip were 7,059 pounds of which 6,908 pounds (98%) were BMUS (Table 3, NMFS-HDAR data). The average BMUS landings per trip decreased by 17%. The majority of the decreases in landings can be attributed to butaguchi, onaga, and opakapaka.

Landings volume of butaguchi in the *Ho'omalu* zone does not necessarily reflect actual catch volume. Data from the previous observer program indicate that as many as half or more of the butaguchi caught in the *Ho'omalu* zone are released. Anecdotal information indicates that the butaguchi releases are not generally size dependent but rather predicated upon shelf life and value. A similar number of white ulua are also released; most large white ulua are released because of market preferences for smaller fish. Since butaguchi and white ulua are of relatively low value, neither is targeted from the outset of the trip. They are used as fillers or to "make weight" later in the trip to offset any shortfalls in target species volume. Most fishermen have been releasing these fish alive when they are caught early in the trip. Kahala, which have zero market value due to implication with ciguatera as well as a perception of competition with opakapaka for prey resources, are usually killed before being returned to the ocean.

The large number of releases of nontarget species may affect fishing mortality assumptions for these species. The additional unknown fishing mortality caused by capture stress and catch predation may or may not combine to show an adverse effect on the health of the stocks not apparent from the retained catch figures alone. Bottomfish releases, as well as mortality estimates, are

needed to improve the annual assessment of the NWHI bottomfish stocks.

Mau Zone Landings

The *Mau* zone landings have been rising since 1991. BMUS landings have increased 59% over 1993 landings. Landings per trip averaged 2,279 pounds, of which 1,575 pounds (69%) were BMUS. The BMUS catch per trip increased 19% while the overall catch per trip increased by 47%. Uku led the landings (Fig. 5a), followed by butaguchi, opakapaka, hapuupuu, Other BMUS, onaga, and ehu.

The observer data and anecdotal information show that very few salable fishes caught in the *Mau* zone are released. The lower catch rates and the short trip lengths encourage fishermen to retain virtually all of the fish caught on any given trip. The short trips help maintain the high quality and longer shelf life of the catch. It makes economic sense to maintain short trip lengths to minimize costs and maximize profits.

BOTTOMFISH PRICES

The overall 1994 market prices for bottomfish (all sources) in Hawaii have shown a slight increase over 1993 levels (Table 9, Fig. 6A-C). Total landings for Hawaii have also shown an increase, which translates into a total bottomfish revenue of $2.9 million (Table 10). Figure 7 shows the revenue breakdown by year and area, with the exception of 1994 for which the import data were unavailable.

The 1994 NWHI average price by species improved somewhat, primarily due to onaga and opakapaka, the premier restaurant fishes. The high value of these fishes is maintained by the demand from hotels and restaurants that cater to Hawaii's visitor industry; therefore, the price structure is affected both by the lower value of imported bottomfish as well as visitor industry variability.

Although data on volume and value of imported bottomfish were unavailable for 1994 (Figs. 7 and 8), import volume has been increasing at a slow but steady rate. During 1989 the volume of bottomfish imported into Hawaii surpassed the NWHI landings and has surpassed the MHI landings since 1992. The average price per pound of the imported bottomfish (Table 9) continues to rise steadily, although on a species-by-species comparison basis it is not near local values. The acceptable quality of the imports--mainly onaga, ehu, and opakapaka--coupled with the lower prices enable an easy entry into the restaurant fillet market supplied by the NWHI fishery. Only the highly variable quantity, seasonal availability, and the sometimes transient nature of the overseas

fisheries have prevented the Honolulu market from being dominated by the imported bottomfish.

The main Hawaiian island bottomfish continue to be at the high end of the price structure. Prices have not changed substantially from those of 1993. Although these premium quality fishes have increased in price, importers have targeted the high market value species, which has reduced much of the high-end fluctuations in price except in special circumstances; i.e., high seasonal demand or little or no local supply.

RECOMMENDATIONS

We recommend that the modified daily catch form proposed by the Western Pacific Regional Fishery Management Council (Fig. 9) be adopted. This form was modified after an evaluation of the State of Hawaii's 1994 catch report forms and provides data for improved fishing mortality, fishing effort estimates (hours fished) by area, and numbers of fish damaged, lost, or released. The modified form is comparable to the federal daily longline logbook catch log. Information from the NMFS Honolulu laboratory post-trip interviews and a limited number of observer trips indicates that large numbers of fish are sometimes released or lost to predation. The potential impact of both catch predation and releases on stock assessment indicate the need for further investigation. Missing information regarding species, numbers, and sizes of fish released or lost may negatively affect stock assessment.

It is recommended that several bottomfish observer trips be conducted annually to collect detailed data for both protected species interactions and fishery monitoring. Since the fishermen have not officially reported any protected species interactions, the NMFS observer program is especially important for monitoring and documenting these interactions. Based on reporting, research to improve the efficiency of the fishing operations while reducing the interactions may be indicated.

The elimination of the bottomfish observer program because of emphasis on the longline fishery's interactions with protected species, has also eliminated the most detailed fishery (catch and effort) data set for the NWHI. The detailed data collected on these trips has proved to be an invaluable database for more effectively monitoring the health of the stocks.

A voluntary tag-and-release program should also be initiated. Fishermen in the NWHI bottomfish fishery have long expressed support for such a program. Many of the fishermen have volunteered to tag fish that are to be released and to record information on the species, estimated weight, and location. The cumulative number of some fish species released by fishermen during the course of a trip can far exceed that of the annual

catch by research scientists, and the fishermen can provide an expanded tagging program at a low cost. The bottomfish observer program also tagged fish targeted for release. Although this activity was on a time-available basis it can provide an increased knowledge of our commercially valuable bottomfish stocks.

Size frequency sampling of bottomfish catches by *Mau* zone vessels home-ported on Kauai would provide an accurate data set for monitoring the effects of the high level of fishing pressure on the available stocks. The *Mau* zone has sustained a high level of fishing pressure for many years. Information on how the stocks are responding to the fishing pressure will provide valuable information for fisheries managers.

It is recommended that the WPRFMC reduce the number of inactive vessels that have *Ho'omalu* zone permits. All grandfathered permit applications were submitted by the end of 1993. During 1994 seven permits were issued of which two were grandfathered. Four other applicants qualified but were not issued permits for other reasons. Existing regulations should be reviewed as to their effectiveness in eliminating nonactive fishermen to provide opportunities for new entrants.

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Table 1. Northwestern Hawaiian Islands bottomfish landings (1,000 pounds), active vessels and trips, 1986-94.

Area	1986[a]	1987[a]	1988[a]	1989[a]	1990[a]	1991[b]	1992[b]	1993[b]	1994[b]
LANDINGS									
Mau	NA	NA	NA	118	249	103	71	98	160
Hoomalu	NA	NA	NA	184	173	283	353	287	283
TOTAL LANDINGS	869	1015	626	303	421	387	424	385	443
VESSELS									
Mau	NA	NA	4	5	14	14	8	8	12
Hoomalu	NA	NA	12	5	5	4	5	4	5
TOTAL VESSELS	24	28	13[c]	10	16[c]	17[c]	13	12	16[c]
TRIPS									
Mau	NA	NA	21	22	55	84	55	72	99
Hoomalu	NA	NA	72	28	25	47	37	34	41
TOTAL TRIPS	163	134	93	50	80	131	92	106	140

[a]Estimates based on NMFS-monitored trips only.
[b]NWHI data from combination NMFS and HDAR.
[c]Total may not match sum due to vessel participation in both areas.

Table 2. Hawaii's market for bottomfish caught in the Northwestern Hawaiian Islands and the main Hawaiian Islands, based on market expansion estimates by the National Marine Fisheries Service, 1988-94. Columns may not total because of rounding and landings not enumerated by source.

Source	1988	1989	1990	1991	1992	1993	1994
			Market Landings (in 1,000 lb sold)				
NWHI	626	303	421	387	424	385	443
MHI	1,164	1,006	645	561	587	426	468
HAWAII TOTAL	1,790	1,309	1,066	948	1,011	811	911
Imports[b]	334	564	620	479	634	550	N/A
Total bottomfish	2,124	1,873	1,686	1,427	1,645	1,361	N/A
			Revenue (in US$1,000)				
NWHI	1,450	750	1,050	1,050	1,250	1,150	1,400
MHI	3,288	3,090					
2,265	1,713	1,842	1,535	1,700			
HAWAII TOTAL	4,738	3,840	3,315	2,763	3,092	2,685	3,100
Imports[b]	774	1,396	1,546	1,300	1,869	1,643	N/A
Total bottomfish	5,512	5,236	4,861	4,063	4,961	4,328	N/A

[a]Preliminary estimate from Hawaii Division of Aquatic Resources data.
[b]Estimated by NMFS (not available for 1994).

Table 3. Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (*Mau* and *Ho'omalu* Zones) using the combined NMFS and HDAR data set for 1991-94.

	1991		1992	
	Mau	*Ho'omalu*	*Mau*	*Ho'omalu*
Vessels (No.)	14	4	8	5
Trips (No.)	84	47	55	37
Trips/vessel (No.)	6	11	6	7
BMUS/trip (lb)	1,201	5,873	1,275	9,468
Total catch/trip (lb)	1,366	6,638	1,690	9,954
Revenue/trip (US$)	3,817	16,960	4,754	28,977
Revenue/vessel (US$)	21,377	199,286	32,687	214,430
	1993		1994	
	Mau	*Ho'omalu*	*Mau*	*Ho'omalu*
Vessels (No.)	8	4	12	5
Trips (No.)	72	34	99	41
Trips/vessel (No.)	9	8	8	8
BMUS/trip (lb)	1,323	8,414	1,575	6,908
Total catch/trip (lb)	1,547	8,584	2,279	7,059
Revenue/trip (US$)	4,736	25,553	6,127	22,010
Revenue/vessel (US$)	42,624	217,208	75,832	180,485

Table 4. List of common and scientific names of frequently caught species (BMUS = bottomfish management unit species).

Common name	Scientific name
	BMUS
Onaga	*Etelis coruscans*
Opakapaka	*Pristipomoides filamentosus*
Ehu	*E. carbunculus*
Kalekale	*P. seiboldii*
Gindai	*P. zonatus*
Uku	*Aprion virescens*
Lehi	*Aphareus rutilans*
Yellowtail kalekale	*P. auricilla*
Hapuupuu	*Epinephelus quernus*
Butaguchi	*Pseudocaranx dentex*
White ulua	*Caranx ignobilis*
Black ulua	*C. lugubris*
Kahala	*Seriola dumerili*
Taape	*Lutjanus kasmira*
	Other Bottomfish
Papa ulua	*Carangoides orthogrammus*
Omilu	*Caranx melampygus*
Hogo	*Pontinus macrocephalus*
Miscellaneous bottomfish	

Table 5. Activity of the bottomfish fleet in the Northwestern Hawaiian Islands, 1988-94 (BMUS = bottomfish management unit species). Data for 1991[a]-94[a] are based on a consistent sample, by the NMFS, of the fleet in each year. Data from 1991[b]-1994[b] come from a combined NMFS-HDAR data set.

	1991[a]	1992[a]	1993[a]	1994[a]	1991[b]	1992[b]	1993[b]	1994[b]
Vessels (No.)	14	10	12	12	17	13	12	16
Trips (No.)	73	78	88	80	131	92	106	140
Trips/vessel (No.)	5	7	7	7	7	7	8	8
Days at sea	978	1,079	1,186	1,305	NA	NA	NA	NA
Days fished	503	660	644	680	NA	NA	NA	NA
Days/trip	13	13	13	18	NA	NA	NA	NA
BMUS/trip (lb)	3,644	4,160	3,834	4,474	2,878	4,570	3,597	3,137
Total catch/ trip (lb)	4,104	4,528	4,005	4,695	3,258	5,014	3,804	3,679
BMUS/fishing day (lb)	525	491	523	526	NA	NA	NA	NA
Total catch/ fishday (lb)	591	535	547	552	NA	NA	NA	NA
Revenue/trip (US$)	10,045	12,956	12,103	14,449	8,532	14,496	11,413	10,779
Revenue/vessel (US$)	52,381	101,062	88,756	96,327	65,753	102,588	100,819	125,757

Table 6. Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (*Mau* and *Ho'omalu* Zones), 1991-94 (BMUS = bottomfish management unit species). Data are from NMFS-monitored trips only and may not match those in Table 3 due to rounding and extrapolation

	1991		1992		1993		1994	
	Mau	*Hoomalu*	*Mau*	*Hoomalu*	*Mau*	*Hoomalu*	*Mau*	*Hoomalu*
Vessels (No.)	11	4	5	5	8	4	8	5
Trips (No.)	37	36	42	36	56	32	42	38
Trips/vessel (No.)	4	9	8	7	7	8	5	7
Days at sea	362	615	399	677	520	662	453	851
Days fished	218	288	243	414	274	364	252	425
Day fished/trip	5.9	8	5.8	11.5	4.9	11.4	6	11.2
Days/trip	9.8	17.1	9.5	18.8	9.3	20.7	10.8	22.4
BMUS/trip (lb)	1976	5368	1388	7393	1312	8248	2128	7068
Total catch/trip (lb)	2151	6112	1786	7726	1484	8417	2432	7196
BMUS/fishing day (lb)	333	671	239	639	267	723	353	629
Total catch/ fishing day (lb)	364	764	308	668	302	738	403	640
Revenue/trip (US$)	5732	14479	4941	22309	4667	25114	7082	22591
Revenue/vessel (US$)	19281	130311	41505	160626	32675	200918	12768	171692

Table 7.--Species composition of bottomfish landings in the Northwestern Hawaiian Islands, 1988-94 (BMUS = bottomfish management unit species). Totals may not sum due to rounding.

	Catch (in 1000 lb)						
Species	1988	1989	1990	1991[a]	1992[a]	1993[a]	1994[a]
Opakapaka	154	112	79	86	145	158	145
Onaga	80	13	21	46	23	40	43
Ehu	45	9	25	20	8	11	15
Hapuupuu	156	66	85	59	57	60	69
Butaguchi	111	57	103	75	79	64	61
Uku	6	5	60	69	86	33	78
Other BMUS	69	39	42	22	22	15	27
Total BMUS	621	302	415	377	420	381	438
Other bottomfish	5	1	8	10	4	4	5
Total bottomfish	626	303	423	387	424	385	443
	Value (in US$1000)						
Species	1988	1989	1990	1991[a]	1992[a]	1993[a]	1994[a]
Opakapaka	546	416	322	304	577	591	592
Onaga	265	40	77	206	89	131	186
Ehu	90	16	63	54	20	36	47
Hapuupuu	274	158	194	148	146	167	195
Butaguchi	115	71	137	89	119	107	102
Uku	NA	NA	NA	204	269	99	204
Other BMUS	165	50	261	36	28	27	46
Total BMUS	1,457	753	1,057	1,040	1,250	1,158	1,372
Other bottomfish	6	2	9	13	5	6	10
Total bottomfish	1,464	756	1,066	1,053	1,255	1,164	1,382

[a]Combination NMFS-HDAR data set.

Table 8. Northwestern Hawaiian Islands bottomfish management unit species landings composition per trip, 1992-94. Data is from the combined NMFS and HDAR data set and may not match Table 3 due to rounding.

	1992		1993		1994	
Species	*Mau*	*Ho'omalu*	*Mau*	*Ho'omalu*	*Mau*	*Ho'omalu*
Opakapaka	448	3208	382	3849	229	2984
Onaga	124	450	66	1042	114	771
Ehu	48	148	69	185	81	172
Hapuupuu	121	1386	210	1305	150	1318
Butaguchi	336	1660	415	1004	346	655
Uku	100	2187	112	736	529	623
Other BMUS	56	425	67	291	124	381
Total per trip	1273	9464	1321	8412	1573	6904

Table 9. Hawaii's bottomfish prices (US$/lb) by capture location, and Hawaii's bottomfish market prices by species and source, 1991-94. NMFS estimates. (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands).

Species	Market[a]	NWHI[b]	MHI[c]	Market[a]	NWHI[b]	MHI[c]
		1991			**1992**	
Opakapaka	3.89	3.53	4.13	4.08	3.98	4.16
Onaga	5.06	4.47	5.36	5.24	3.87	5.69
Ehu	3.00	2.71	4.07	3.72	2.51	4.07
Hapuupuu	2.72	2.50	3.21	2.74	2.57	3.43
Butaguchi	1.46	1.19	1.92	1.56	1.51	3.32
Uku	1.64	2.95	3.29	1.46	3.13	3.31
Other BMUS	1.58	1.65	2.40	1.74	1.29	2.55
Other bottomfish	1.56	1.31	2.06	2.28	1.33	1.77
Imports[d]	2.72			2.96		
Total bottomfish	1.97	2.72	3.82	1.97	2.96	3.91
		1993			**1994**	
Opakapaka	3.99	3.74	4.28	4.13	4.08	4.17
Onaga	5.03	3.27	6.18	5.65	4.32	6.63
Ehu	4.06	3.27	4.45	4.06	3.15	4.75
Hapuupuu	2.86	2.78	3.25	2.95	2.82	3.62
Butaguchi	1.74	1.67	2.75	1.70	1.68	2.00
Uku	3.13	3.01	3.19	2.84	2.62	3.06
Other BMUS	1.55	1.83	1.50	1.66	1.72	1.64
Other bottomfish	2.10	1.50	2.17	2.10	1.92	2.13
Imports[d]	3.02			3.12		
Total bottomfish	3.33	3.02	3.60	3.28	3.12	3.63

[a]Weighted average.
[b]NMFS estimate.
[c]HDAR figures.
[d]Estimated as equivalent to the NWHI average price.

Table 10. Hawaii's commercial bottomfish landings, 1970-94, based on data from the Hawaii Division of Aquatic Resources (1970-1978) and NMFS estimates (1979-1994).

Year	Landings (x 1000 lb)	Revenue (x $1000)	Price[a] (US$/lb)
1970	344	253	2.96
1971	410	312	2.95
1972	407	366	3.37
1973	454	418	3.30
1974	413	421	3.30
1975	544	577	3.15
1976	558	693	3.51
1977	562	764	3.64
1978	740	1,100	3.72
1979	809	1,296	3.60
1980	856	1,218	2.86
1981	993	1,794	3.29
1982	1,162	2,177	3.22
1983	1,422	3,228	3.79
1984	1,464	3,147	3.47
1985	1,687	3,754	3.40
1986	1,680	3,952	3.51
1987	1,799	4,645	3.67
1988	1,790	4,788	3.59
1989	1,310	3,840	3.79
1990	1,082	3,335	3.73
1991	949	2,713	3.19
1992	1,011	3,052	3.21
1993	811	2,695	3.43
1994	911	2,985	3.28

[a]Prices were calculated from landings (pounds caught) rather than pounds sold.

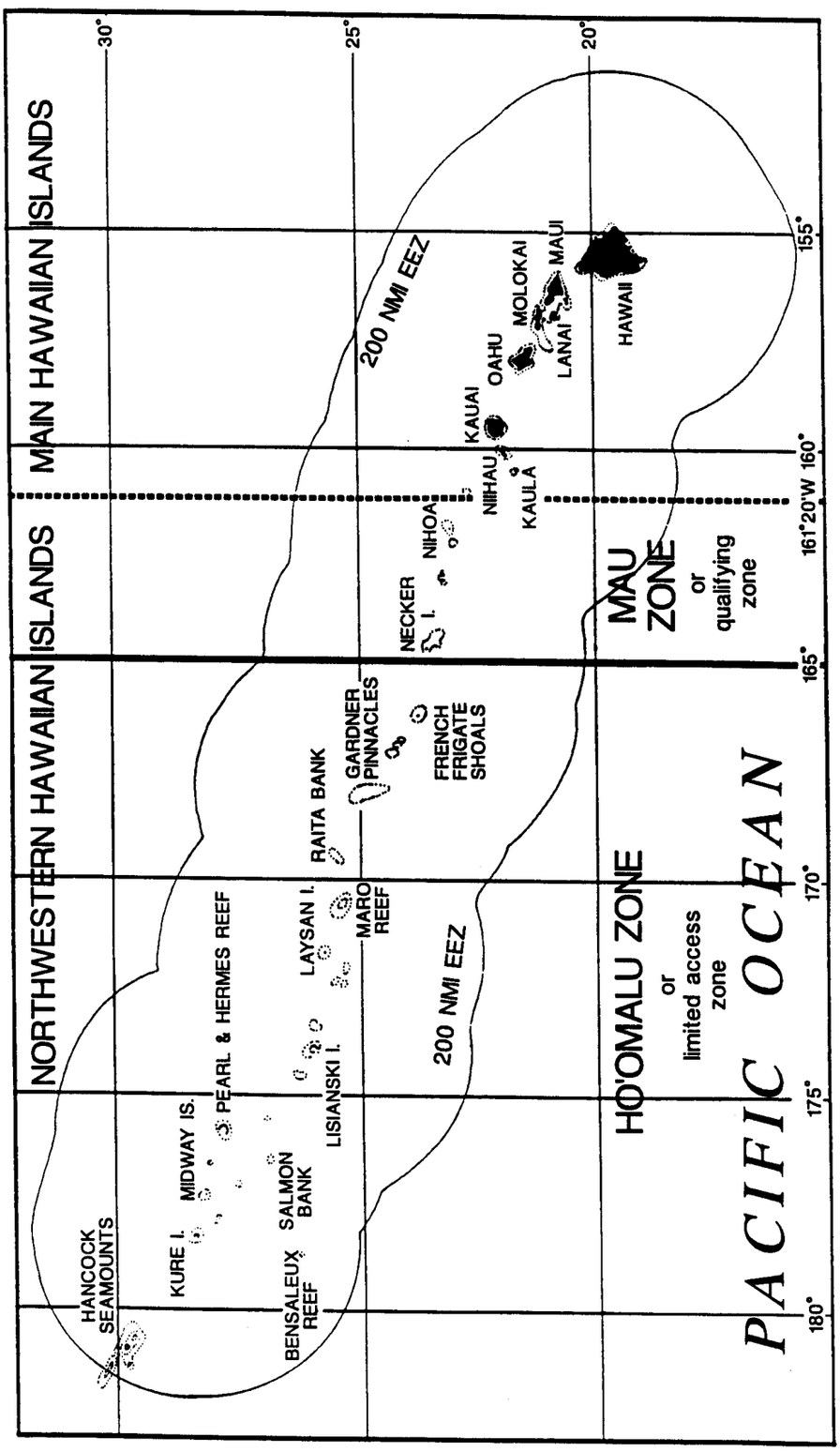

Figure 1.--Map of the Northwestern Hawaiian Islands.

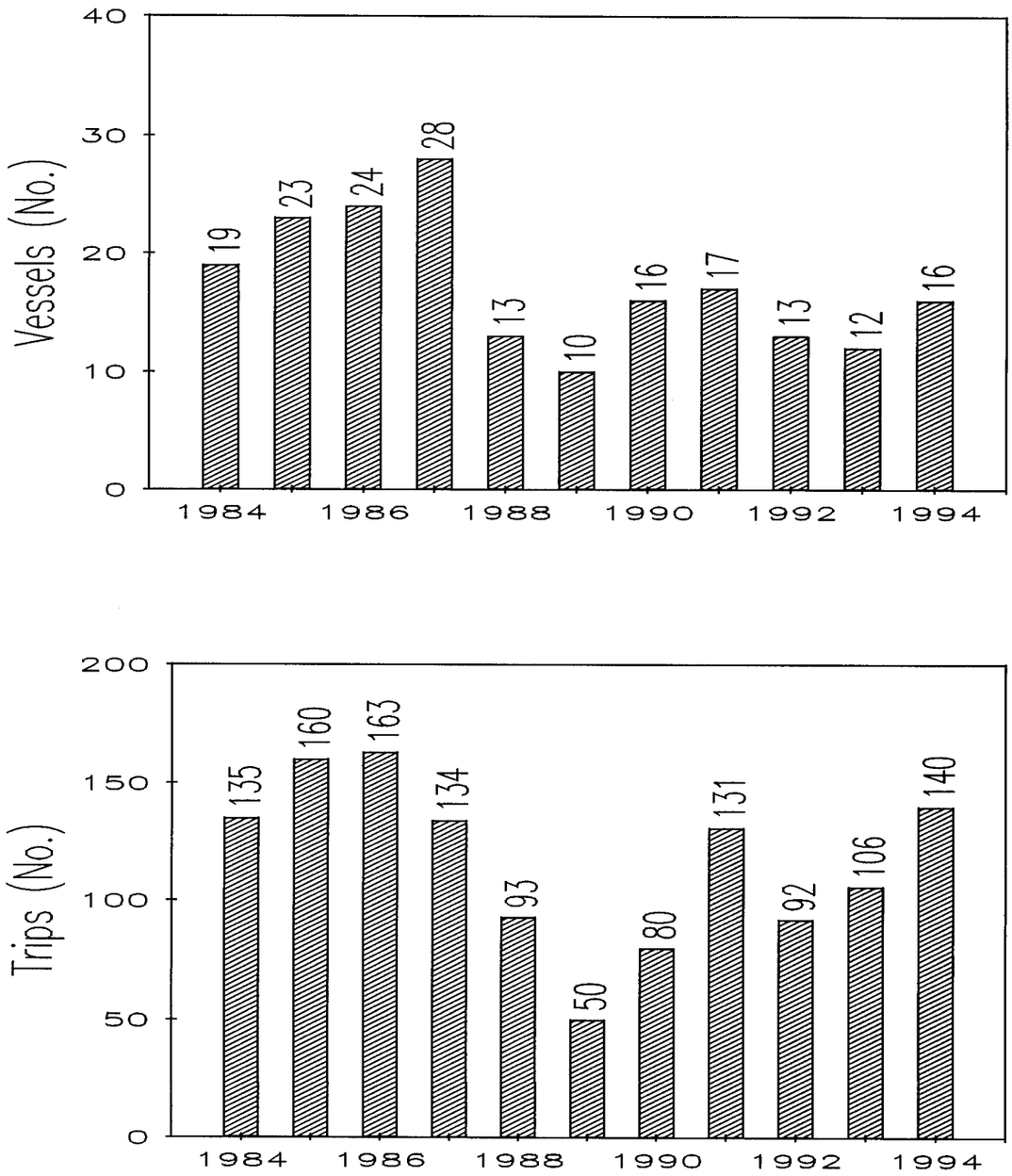

Figure 2.--The bottomfish fleet in the Northwestern Hawaiian Islands, 1984-94: (A) number of vessels and (B) trips. Data for 1984-90 are from the monitoring program of the National Marine Fisheries Service. Data for 1991-94 are from the combined NMFS-HDAR data set.

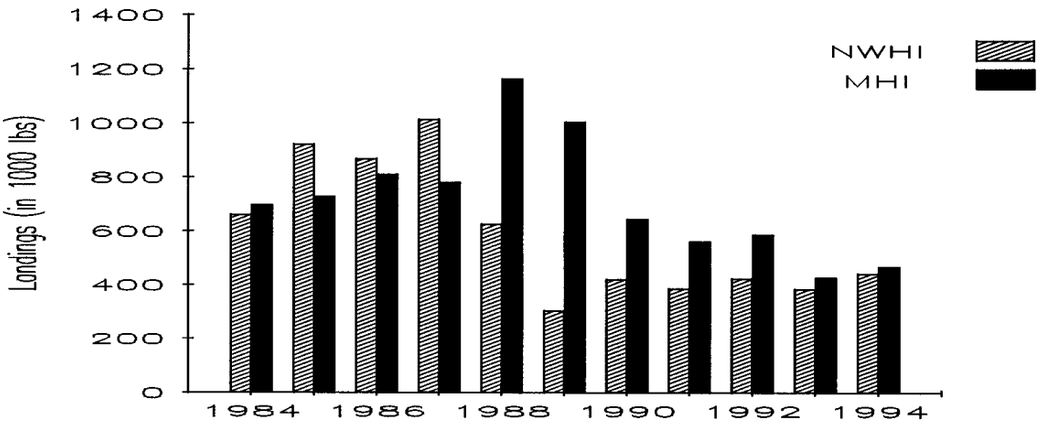

Figure 3.--Hawaii's bottomfish landings, 1984-94, based on estimates made by the National Marine Fisheries Service (NWHI = Northwestern Hawaiian Islands, MHI = Main Hawaiian Islands).

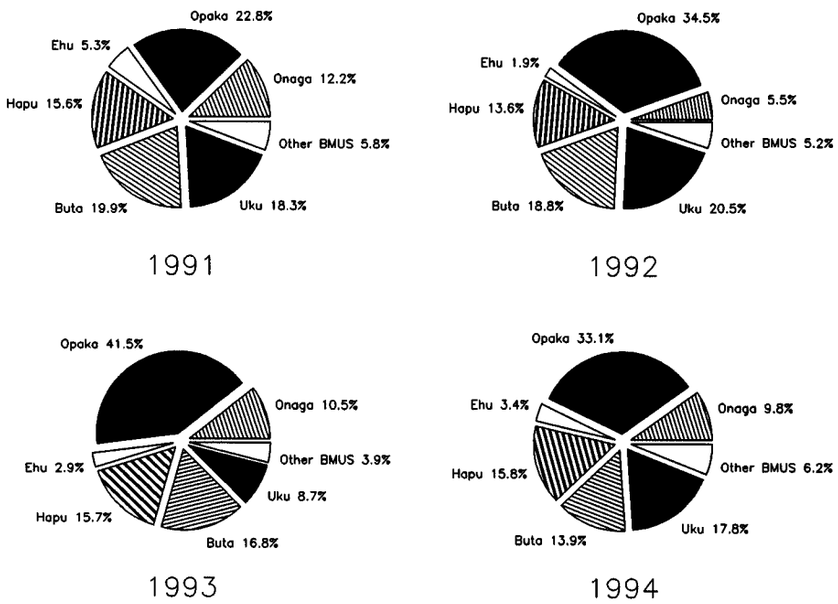

Figure 4.--Composition of landings (by weight) of bottomfish management unit species by the bottomfish fleet in the Northwestern Hawaiian Islands, 1991-94.

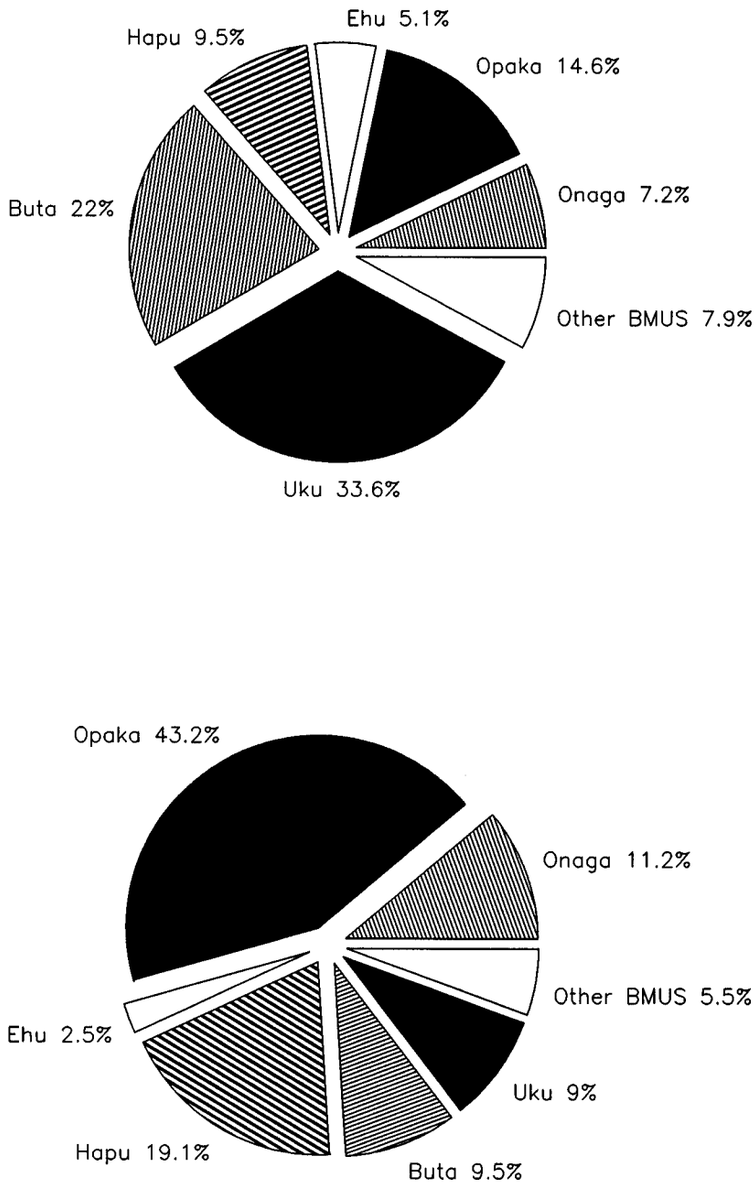

Figure 5.--Species Composition of landings (by weight) of bottomfish and species landed in (A) the *Mau* Zone (top) and (B) the *Ho'omalu* Zone (bottom) in 1994.

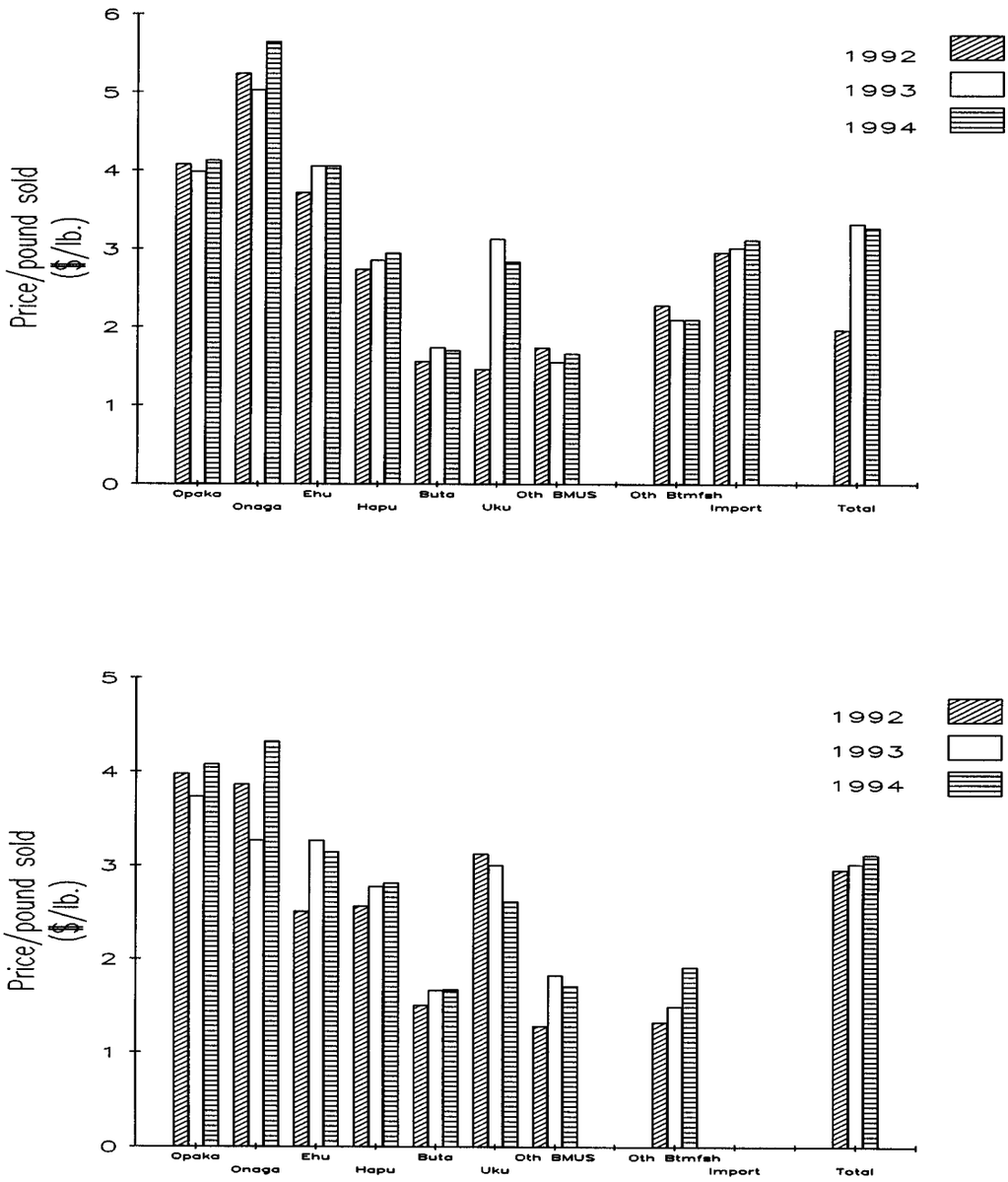

Figure 6.--Hawaii's 1992-94 market prices for bottomfish: (A) NWHI and MHI combined (top) and (B) NWHI alone (bottom).

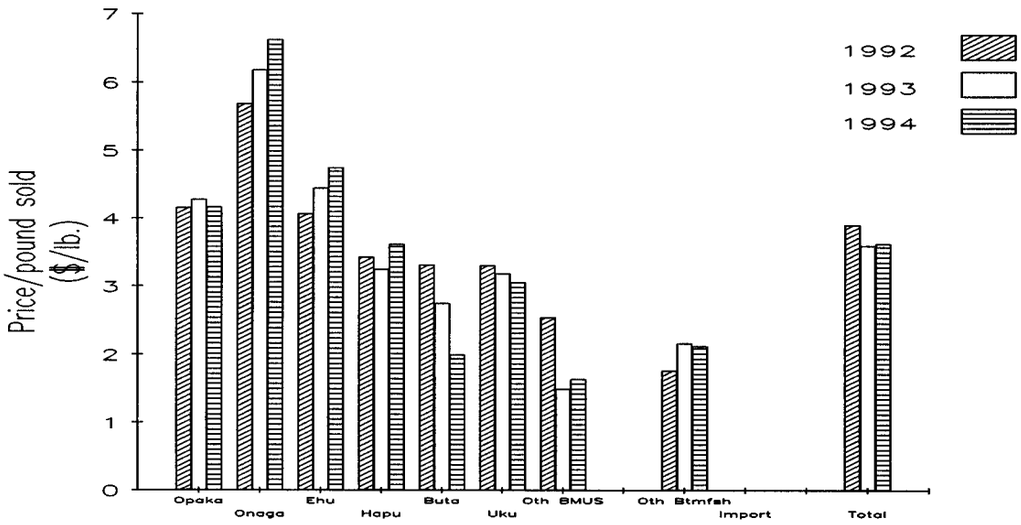

Figure 6.-Continued. (C) MHI.

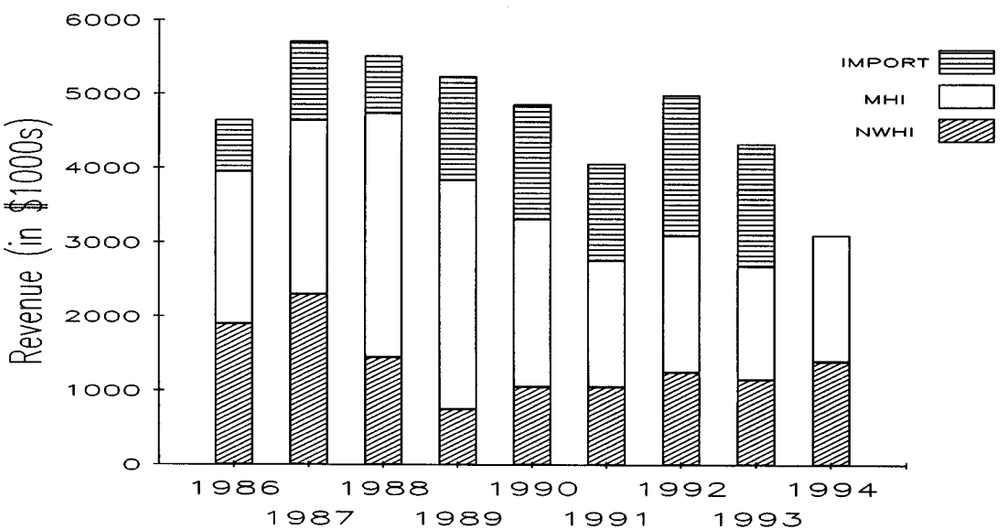

Figure 7.--Hawaii's bottomfish market revenue, 1986-94 (NWHI = Northwestern Hawaiian Islands, MHI = Main Hawaiian Islands). Data from NMFS market monitoring program. Import data for 1994 unavailable.

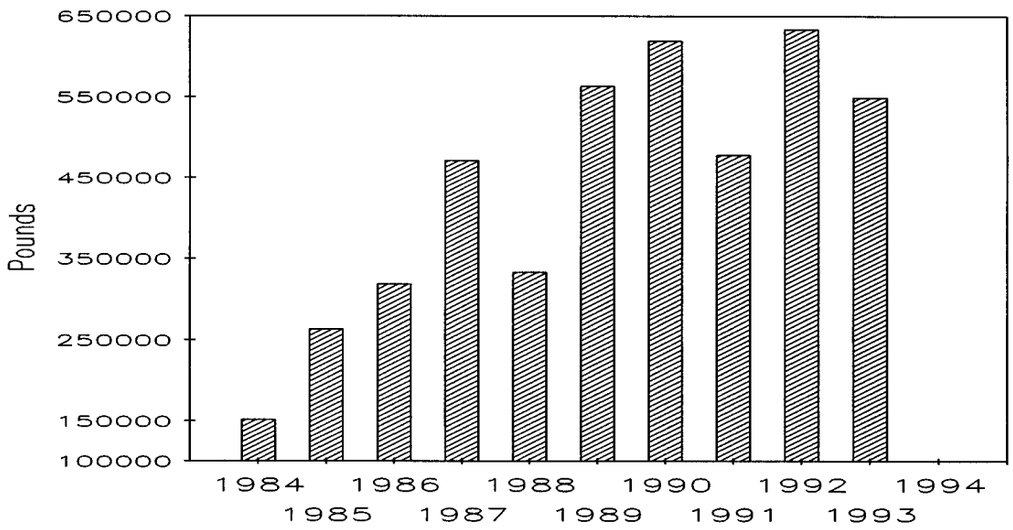

Figure 8.--Bottomfish imports to Hawaii, 1984-93. Data for 1994 unavailable. Data from NMFS Market News.

DAILY BOTTOMFISH CATCH LOG - NORTHWESTERN HAWAIIAN ISLANDS

Vessel_____ **Permit No. BFP**_____ **Date**_____

Latitude____° ____" N **Longitude**____° ____" W **Bank** _____

Current Speed/Direction_____(Knots)/_____ **Wind Speed/Direction**_____/_____

No. of Lines_____ **No. of Hooks/Line**_____ **Wave Height** (ft)_____

No. Hours Fished: Day_____ Night_____ **Depth Range** (fm)_____

Species	Tally Area	No. Kept	No. Damaged/Lost	No. Released
1 Opakapaka				
2 Onaga				
3 Ehu				
4 Uku				
5 Hapuupuu				
6 Butaguchi				
7 White Ulua				
8 Kahala				
9 Others:				

DAILY PROTECTED SPECIES INTERACTION LOG

Species	Sighted in Area of Gear		Released or Lost					
			Alive		Injured		Dead	
	Tally	Total	Tally	Total	Tally	Total	Tally	Total
50 Dolphin								
53 Green Turtle								
58 Other Turtle								
51 Monk Seal								
55 Albatross								
56 Booby								
57 Others (specify)								

Description & Location of Interaction --

Bank _____

I certify that the above information is complete and true to the best of my knowledge.

Captain_____ **Date**_____

Figure 9.--Proposed Federal Daily Bottomfish Catch Log.