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BOTTOMFISH FISHERY IN THE NORTHWESTERN HAWAIIAN ISLANDS, 1990

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RECENT DEVELOPMENTS

Since the implementation of the bottomfish limited entry plan in the Northwestern Hawaiian Islands (NWHI)(Fig. 1) in 1989 by the Western Pacific Regional Fishery Management Council, the level of effort directed toward bottomfish fishing in the Ho'omalu Zone (the limited access area) has remained relatively stable. Unfortunately the displaced vessels were forced into the Mau Zone (the open access area), consequently increasing fishing pressure on this relatively limited area and its resources.

In 1990, a total of 23 permits were issued for the two permit zones, and the number of vessels that fished the NWHI increased 60% from 1989 (Fig. 2). Four of the permits were issued for the Ho'omalu Zone and 19 permits were issued for the Mau Zone. In 1990 only 7 of the 16 active vessels in the bottomfish fleet made trips with any regularity: 4 vessels in the Mau Zone and 3 vessels in the Ho'omalu Zone.

The majority of the captains commented that catch rates of target species have declined throughout the years. Data confirm that catches--all species and bottomfish management unit species (BMUS; see Table 1 for a listing of common and scientific names)--continue to decline. Fishermen have theorized that, although increased fishing pressure has had a detrimental effect on bottomfish stocks, the abundance of sharks and other predators has had an even greater adverse effect. The shark problem, which is more prevalent in the Mau Zone, causes major disruption, wasting fish and fishing time. It has been reported that sometimes only 1 in 20 hooked fish is landed. Some fishermen are advocating a NWHI shark eradication or bounty program and have begun landing and finning sharks.

In addition to similar comments received last year on the abundance and aggressiveness of the kahala, interest in ciguatera testing of this once marketable species has resurfaced. There was also much concern stemming from an apparent abundance of butaguchi. Having a relatively short shelf life, Butaguchi are routinely released by many vessels at the beginning of the fishing operation because the ice and hold spaces are reserved for species that command higher prices.

The unprecedented abundance of uku in the NWHI has mirrored the 1988-89 abundance of this species in the main Hawaiian Islands (MHI). Uku, usually caught by bottom handline gear, were so abundant that they were successfully targeted and caught with trolling gear. This vulnerability to trolling led to some controversy regarding legality of bottomfish being caught by vessels without permits while using nontraditional methods and gear. Several vessels capitalized on the vulnerability of the

uku during this period of legal uncertainty. The NOAA general counsel subsequently settled this dilemma by ruling that the BMUS may not be taken by any method from nonpermitted vessels.

No interactions with Hawaiian monk seals, *Monachus schauinslandi;* sea turtles; or dolphins, *Tursiops* sp., were reported. The National Marine Fisheries Service (NMFS) fielded an observer on one bottomfish vessel in 1990 and has completed two additional observer trips thus far in 1991.

FLEET OPERATIONS IN THE NWHI

In the NWHI fleet which is monitored in Honolulu by personnel of the Fishery Management Research Program of the Honolulu Laboratory, Southwest Fisheries Science Center, NMFS, NOAA. There were 80 monitored trips made by 16 individual vessels (Fig. 2). This represents a 60% increase both in the number of bottomfish trips and in the number of participants. The average trip lasted 12.5 days: 6.5 days of fishing and 6 days of travel (N = 36 trips). Each vessel averaged five trips in 1989 and 1990. The areas fished ranged from the island of Nihoa to Pearl and Hermes Reef.

Monitored NWHI landings for all species per trip in 1990 averaged 4,414 lb, 1,640 lb less than in 1989 (Table 2).[1] BMUS landings per trip averaged 4,053 lb and accounted for 91% of the total landings, higher than the 80-84% range for the 1986-89 period. Ho'omalu Zone landings averaged 5,715 lb per trip with 5,406 lb (94%) of BMUS (Table 3). The Mau Zone averaged 3,820 lb per trip with 3,438 lb (90%) of BMUS.

Effort in the Mau Zone increased greatly in 1990 as 14 vessels made 55 trips in this relatively small area (Table 3); however, only 4 of the vessels fished regularly. Landings totaled nearly 67% over 1989. BMUS accounted for 89.9% of the total landings. The fishing area ranged from Nihoa to Twin Banks, and fishing trips to the Mau Zone averaged 10.5 days with 6 days of fishing (N = 23 trips).

Although there were four permitted vessels in the Ho'omalu Zone, only three fished regularly. Vessels averaged 5 trips, for a total of 25 trips. The areas fished were from French Frigate Shoals to Pearl and Hermes Reef. The majority of the fishing activities were centered in the Brooks Banks to Maro Reef area. Because of declining catch rates, most of the vessels fished the closer areas in an effort to cut expenses. The average trip lasted 16.5 days with 8 days of fishing (N = 13 trips). Four tuna longline vessels participated in the bottomfish fishery:

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[1]The NWHI vessel activity and landings shown in Table 2 are underestimated because of unmonitored landings.

one in the Ho'omalu Zone and three in the Mau Zone. Two vessels made a combination tuna longline-bottomfish trip to the NWHI.

Comparisons of trip operations and landings in the management areas for 1989 and 1990 are also shown in Table 3. Operations in the Ho'omalu Zone were relatively stable. The number of vessels and average number of trips remained the same, while days at sea decreased and days fished increased. BMUS catch per trip remained stable but required more fishing days. Revenue per trip fell slightly. The Mau Zone, however, was in a state of change. While the effort in terms of days fished increased 127%, the BMUS catch per trip and per fishing day decreased 23% and 15%, respectively. The overall catch per trip dropped 33%, resulting in a 36% drop in average trip revenue.

BOTTOMFISH LANDINGS

Although a 60% increase occurred in the number of fishing trips, the total NWHI landings increased only 16.6%. Based on NMFS estimates, bottomfish landings increased for the NWHI and decreased for the MHI (Table 4, Fig. 3). The NWHI increase was not suprising as effort also increased (Tables 2 and 3). The decrease in fish caught in the MHI was largely due to a decrease in the number of uku caught.

Species composition for the NWHI is provided in Table 5. The top five species accounted for 75.4% of all BMUS landings (Fig. 4). For the first time, more butaguchi were landed in the fishery than were any other species (24.8%). Hapuupuu, the 1988 leader in landings, was second with 20.5%, and opakapaka, the 1989 leader, was third with 19.1%. The unusually high catch of uku, which are usually combined with other BMUS, resulted in their being fourth (18.7%). Onaga, other BMUS (excluding uku), and ehu accounted for 5.1, 5.8, and 6.0% of the BMUS landings, respectively.

This is the first year that landings from the Mau Zone were higher than those from Ho'omalu Zone. Butaguchi led the Mau Zone BMUS landings with 26.9% (Fig. 5A), closely followed by uku landings (24.2%). Hapuupuu, opakapaka, and ehu landings were 17.2%, 15.7%, and 9.0%, respectively. Other BMUS (excluding uku) accounted for 5.6%. Landings of uku from the Mau Zone increased by over 900%. Most of the uku were caught with trolling gear, but trolling activities for ono decreased in 1989 because of its scarcity.

In the Ho'omalu Zone, the BMUS landings (by weight) totaled 94.6% of all landings. Hapuupuu led the BMUS landings with 25.1% (Fig. 5B), closely followed by opakapaka with 23.8% and butaguchi with 21.9%. Uku and onaga landings equaled 11.1% and 10.2%, respectively. Other BMUS (excluding uku) totaled 6.2%. The

species composition for the MHI is not given because of potential sample bias.

Overall prices for bottomfish rose again in 1990 (Table 6, Fig. 6A). The NWHI prices for the major species did not show a marked increase, but opakapaka, onaga, and ehu prices rose substantially (Fig. 6B). The MHI prices rose substantially, led by the same three snappers (Fig. 6C). Total bottomfish revenue from the Hawaii landings fell in 1990 to $4.4 million, as did the overall market (including imports) to $5.5 million (Table 4, Fig. 7).

BOTTOMFISH IMPORTS TO HAWAII

Import data for Hawaii were obtained from the U.S. Food and Drug Administration (FDA) and compiled by the NMFS Southwest Region. The bottomfish Hawaiian imports, mainly from the Pacific island nations, increased in 1990 to over 600,000 lb (product weight)(Fig. 8). The majority of the bottomfish imports were snappers. The FDA data system does have some limitations because of sensitivity of the threshold level (> $x value) of tracking quantities of individual lots; therefore, the quantity of bottomfish imported is underestimated.

DATA SOURCES

Two systems are used to monitor bottomfish landings in Hawaii: The State of Hawaii's Division of Aquatic Resources (HDAR) compiles reports of the commercial fisheries landings, and the NMFS Honolulu Laboratory's Fishery Management Research Program monitors seafood sales at a number of wholesale locations. Both systems have significant limitations, for neither monitors the fish landed by recreational or subsistence fishermen. Additionally, a potentially major source of unreported and unmonitored data is Hawaii's large number of "recreational/part-time commercial" fishermen who sell their catches directly to wholesalers and retailers.

Despite ongoing efforts to improve the HDAR catch reporting of commercial landings, there is evidence that the data still represent a high degree of underreporting. Each segment of the fisheries is biased to a certain degree, because of the levels of compliance in reporting. The HDAR data on bottomfish landings from 1970 through 1989 are presented in Table 7.

Data from the NMFS monitoring program are limited to percentage of the total landings monitored. The sample changes from year to year in terms of the number of days and the species and locations monitored. The data are presented as an expanded estimate to approximate total market volume. The market expansion factors are based on a 1979 survey of wholesale markets

in Hawaii and on landing patterns of specific fleets. The expansion factors range from 1 (sample represents the entire market for a particular gear and species combination) to 2 (sample is half of the total market). The basis for the expansion should change over time as the market changes, but a reliable means for making such adjustments is not presently available; therefore, the expansion factors have remained static. The Honolulu Laboratory should complete a survey of wholesale seafood dealers in 1991. Data from this survey will be used to update the current expansion factors where applicable.

The NMFS monitoring program also collects ex-vessel price information. Average prices are adjusted during the market volume expansion procedure to account for differences in prices at various sales locations.

The NMFS coverage of NWHI landings is nearly complete, although some trips landed fish on an unmonitored day or through an unmonitored source. Five complete landings, in addition to 3,000-5,000 lb of mixed catch, are estimated to have not been monitored. In late 1990 and early 1991, the primary monitoring site had a dramatic increase in the volume of fish sold per day. This increase was primarily due to the tuna-swordfish longline fleet. The delay in unloading and selling bottomfish catches has already prompted some fishermen to sell their catches outside the monitored site. It is foreseen that this trend will continue and will pose a monitoring problem.

The coverage of the landings from the MHI is lower, possibly as low as 50% of the total, and perhaps even less for Maui and Kauai. Year-to-year estimates must be carefully compared.

RECOMMENDATIONS

The Western Pacific Regional Fishing Management Council's voluntary NWHI bottomfish logbook program, initiated in 1988, provided highly variable results and was discontinued shortly thereafter. A mandatory bottomfish logbook program would provide more detailed data on area fished and catch and effort data needed for management purposes. If the trend of more NWHI bottomfish being sold outside the primary monitoring site continues and perhaps escalates, the potential benefits of a mandatory logbook program definitely warrant consideration.

The domestic observer program, which is mainly concerned with potential interactions of the bottomfish fleet with protected species, is providing accurate, detailed information on catch and effort by the commercial bottomfish operations in the NWHI (Ho'omalu Zone). This program should be continued, at least on a voluntary basis, because it provides a baseline of information on the commercial fishing operations. A voluntary program for the heavily fished Mau Zone should be begun, and the

observer duties should be expanded to include tagging of commercially valuable species.

Data collection efforts need to be expanded to provide a broader data base for improved expansion factors. Data are needed primarily from the islands of Maui and Kauai, areas that have large numbers of bottomfish fishing vessels. A rough estimate of vessels landing fish on Maui and Kauai possibly could be obtained during the seafood survey.

A study to estimate the amount of fish not being reported to the State or monitored by the NMFS should be initiated. Integration of the various NMFS data sources to improve the present picture of the landings and value of Hawaii's fisheries is being completed.

The availability and improved quality of Pacific island and other foreign snappers have increased the quantity of fish being imported into Hawaii. Many wholesalers and fishermen feel that these imports will continue to negatively impact the price structure of locally caught bottomfish. In the future, local prices may indeed be set by outside influences; therefore, these imports should be monitored more closely.

The export of fish in general seems to have increased over the last few years. National marketing efforts by the Hawaii Seafood Promotion Committee and the State of Hawaii's Department of Business, Economic Development and Tourism have resulted in increased interest in "Hawaiian" fish. Monitoring of these exports is currently not being done. A study of Hawaiian seafood exports is needed to complete the picture of the Hawaii market. Many questions may be answered by the wholesaler survey which is to be completed in 1991 by NMFS personnel. This survey would give a snapshot of current activities, but an ongoing data monitoring system needs to be designed to determine long-term market trends.

Table 1.--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 2.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands, 1985-90 (BMUS = bottomfish management unit species). Data are based on a consistent sample of the fleet in each year.

	1985	1986	1987	1988	1989	1990
Vessels (No.)	23	24	28	13	10	16
Trips (No.)	160	163	134	93	50	80
Trips/vessel (No.)	7	7	5	7	5	5
Days at sea		2445	2211	1441	740	990
Days fished		978	938	660	335	530
Days/trip		15	16	15.5	15	12
BMUS/trip (lb)	4659	4803	6145	5502	5036	4053
Total catch/trip (lb)		5805	7303	6842	6054	4414
BMUS/fishing day (lb)		800	877	786	763	611
Total catch/fishing day (lb)		967	1043	977	917	666
Revenue/trip (US$)		13125	17462	16400	14994	11126
Revenue/vessel (US$)		87500	83571	117324	74971	55634

Table 3.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (Mau and Ho'omalu Zones), 1989-90 (BMUS = bottom fish management unit species).[a] Data may not match those in Table 1 because of rounding and extrapolation.

	1989		1990	
	Mau	Ho'omalu	Mau	Ho'omalu
Vessels (No.)	5	5	14	5
Trips (No.)	22	28	55	25
Trips/vessel (No.)	4	5	4	5
Days at sea	275	465	577.5	412.5
Days fished	145	190	330	200
Days/trip	12.5	16.6	10.5	16.5
BMUS/trip (lb)	4,467	5,483	3,438	5,406
Total catch/trip (lb)	5,719	6,318	3,820	5,715
BMUS/fishing day (lb)	677	808	573	675
Total catch/fishing day (lb)	867	931	636	714
Revenue/trip (US$)	15,204	14,829	9,650	14,374
Revenue/vessel (US$)	66,898	83,045	37,911	71,874

[a]Data from monitored trips only.

Table 4.--Hawaii's market for bottomfish caught in the Northwestern Hawaiian Islands (NWHI) and the main Hawaiian Islands (MHI), based on market expansion estimates by the National Marine Fisheries Service, 1984-90. Columns may not total because of rounding and landings not enumerated by source.

Source	1984	1985	1986	1987	1988	1989	1990
			Landings (in 1,000 lb)				
Hawaii	1,358	1,649	1,693	1,884	2,276	1,543	1,260
NWHI	661	922	869	1,015	625	303	421
MHI	697	727	824	869	1,651	1,234	830
Imports	152	264	319	472	334	564	620
Total bottomfish	1,510	1,913	2,012	2,356	2,610	2,107	1,881
			Revenue (in US$1,000)				
Hawaii	--	--	4,500	5,300	6,000	4,622	4,373
NWHI	1,400	1,800	1,900	2,300	1,500	756	1,070
MHI	--	--	2,600	3,000	4,500	3,861	3,300
Imports	--	--	760	1,140	790	1,644	1,130
Total bottomfish	--	--	5,260	6,440	6,790	6,266	5,503

Table 5.--Species composition of bottomfish landings in the Northwestern Hawaiian Islands, 1986-90 (BMUS = bottomfish management unit species).

Species	Catch (in 1,000 lb)				
	1986	1987	1988	1989	1990
Opakapaka	297	370	154	112	79
Onaga	106	77	80	13	21
Ehu	30	40	45	9	25
Hapuupuu	210	223	156	66	85
Butaguchi	160	217	111	57	103
Other BMUS	32	74	75	44	102
Total BMUS	835	1,001	621	302	413
Other bottomfish	35	14	5	1	8
Total bottomfish	870	1,015	626	303	421

Table 6.--Hawaii's bottomfish prices (US$/lb) by capture location, and Hawaii's bottomfish market prices by species and source, 1987-90 (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands).

Species	Market	NWHI	MHI	Market	NWHI	MHI
		1987			**1988**	
Opakapaka	3.56	3.27	3.97	3.51	3.54	3.55
Onaga	4.70	3.24	5.12	4.19	3.30	5.06
Ehu	3.17	2.36	3.75	2.82	2.01	3.80
Hapuupuu	1.93	1.87	2.74	1.96	1.84	2.99
Butaguchi	1.19	1.16	2.51	1.21	1.05	2.54
Other BMUS						
Other bottomfish	2.42	2.11	2.55	1.96	2.23	1.19
Imports	2.67			2.37		
Total bottomfish	3.02			2.71	2.37	2.90
		1989			**1990**	
Opakapaka	3.58	3.78	3.51	4.81	4.19	5.07
Onaga	4.81	3.23	4.92	5.88	3.82	6.10
Ehu	3.36	1.85	3.71	3.96	2.65	4.73
Hapuupuu	2.86	2.61	3.64	2.83	2.65	3.44
Butaguchi	1.85	1.31	3.16	1.66	1.39	3.38
Other BMUS	2.42	1.20	2.52	2.69	2.57	2.62
Other bottomfish	2.08	1.52	2.16	2.27	1.22	2.48
Imports	2.97			2.05		
Total bottomfish	3.12	2.61	3.26	3.11	2.65	4.09

Table 7.--Hawaii's commercial bottomfish landings, 1970-89, based on data from the Hawaii Division of Aquatic Resources.

	Landings (lb)	Revenue (US$)	Inflation-adjusted Price (US$)/lb[a]
1970	339,502	239,564	2.23
1971	406,006	310,021	2.32
1972	402,173	363,238	2.65
1973	446,139	413,523	2.59
1974	405,864	417,066	2.62
1975	555,255	591,645	2.48
1976	557,835	692,434	2.75
1977	560,447	762,327	2.86
1978	738,070	1,098,093	2.92
1979	692,430	1,120,363	2.85
1980	710,063	1,077,861	2.39
1981	637,841	1,253,469	2.81
1982	746,060	1,587,992	2.86
1983	880,169	1,956,060	2.90
1984	1,028,867	2,376,500	2.93
1985	1,079,619	2,646,412	2.94
1986	1,121,067	2,791,173	2.90
1987	1,087,912	3,103,576	3.27
1988	1,299,773	3,600,448	3.22
1989	1,261,535	3,764,535	3.37

[a]Prices were calculated from pounds sold rather than pounds caught; prices were adjusted for inflation to 1990 price levels.

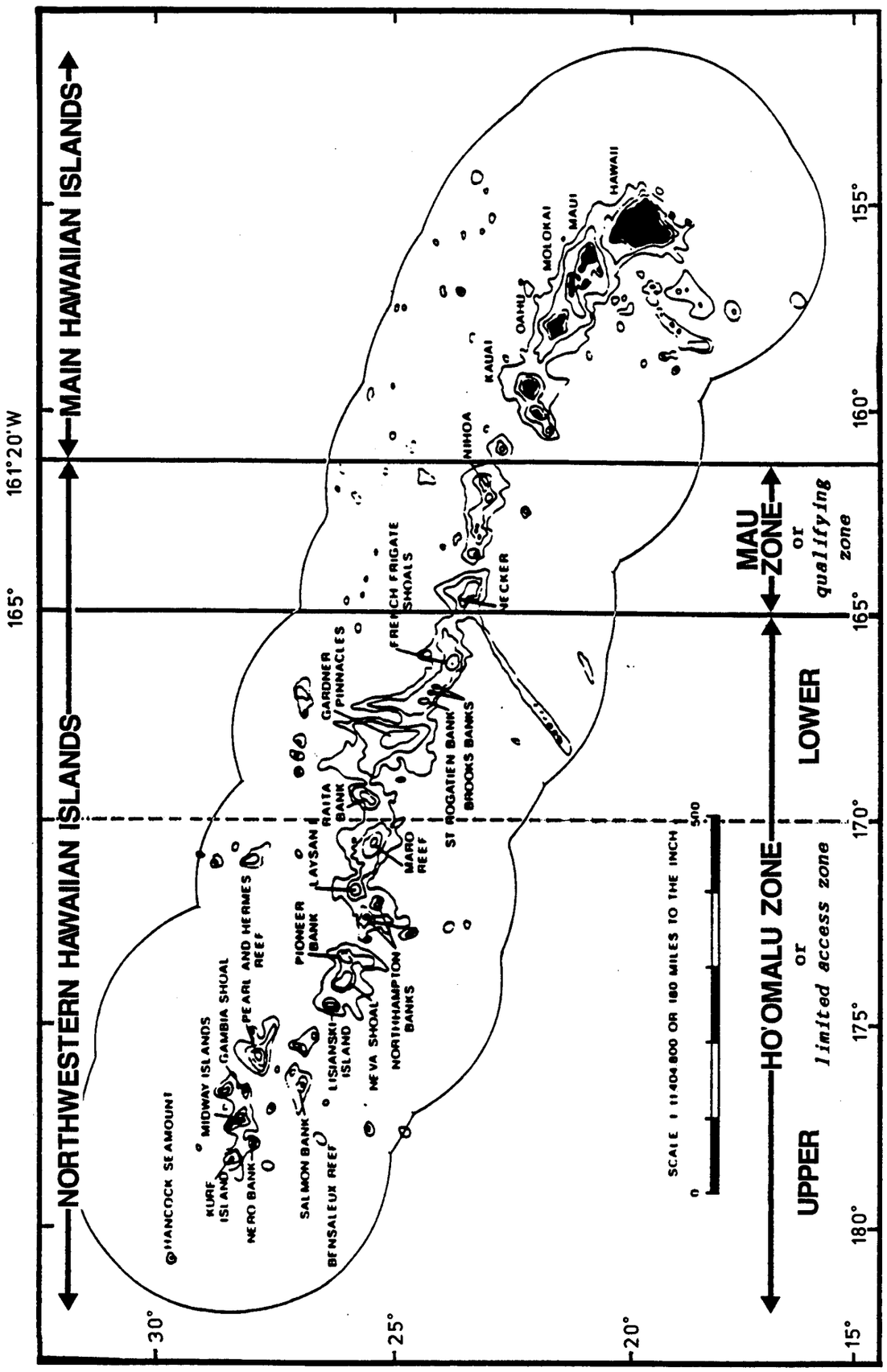

Figure 1.--Map of the Northwestern Hawaiian Islands.

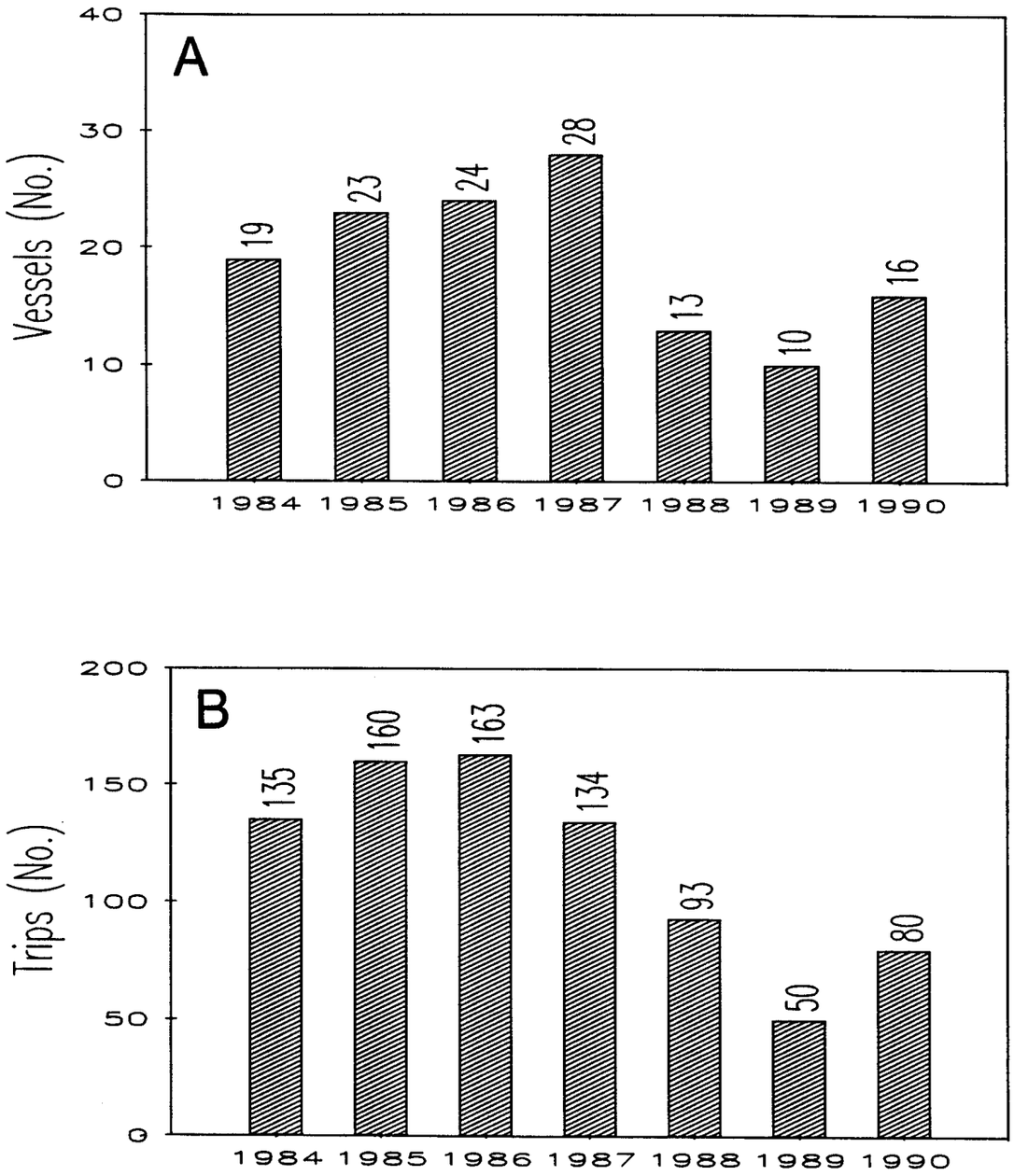

Figure 2.--The bottomfish fleet in the Northwestern Hawaiian Islands, 1984-90: (A) number of vessels and (B) trips. Data are from the monitoring program of the National Marine Fisheries Service.

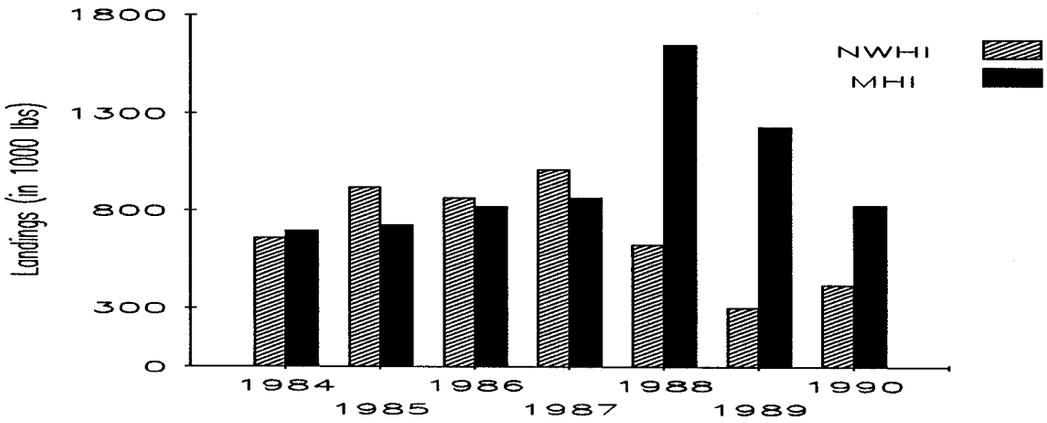

Figure 3.--Hawaii's bottomfish landings, 1984-90, based on estimates made by the National Marine Fisheries Service (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands).

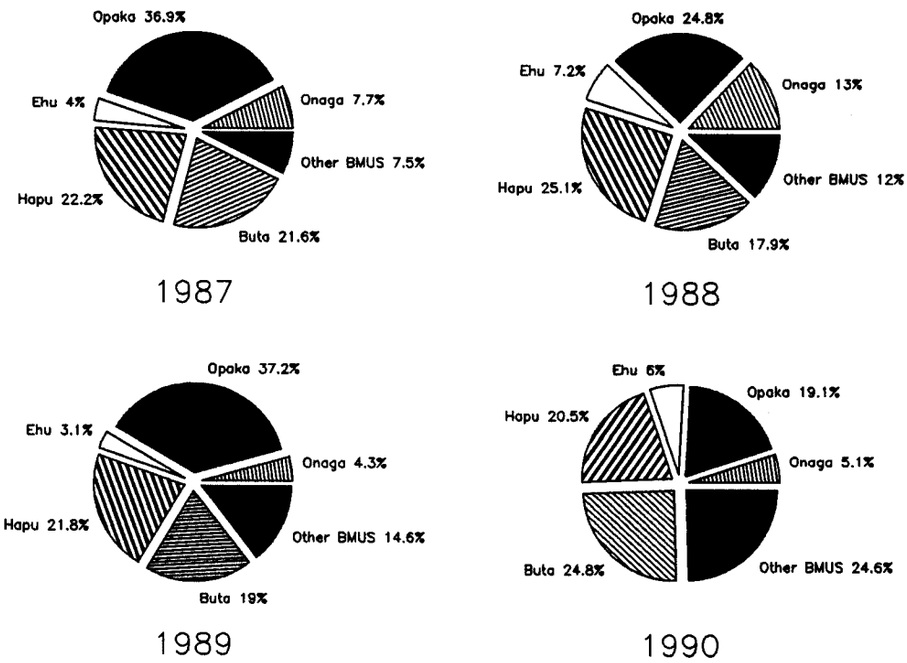

Figure 4.--Composition of landings (by weight) of bottomfish management unit species by the bottomfish fleet in the Northwestern Hawaiian Islands, 1987-90.

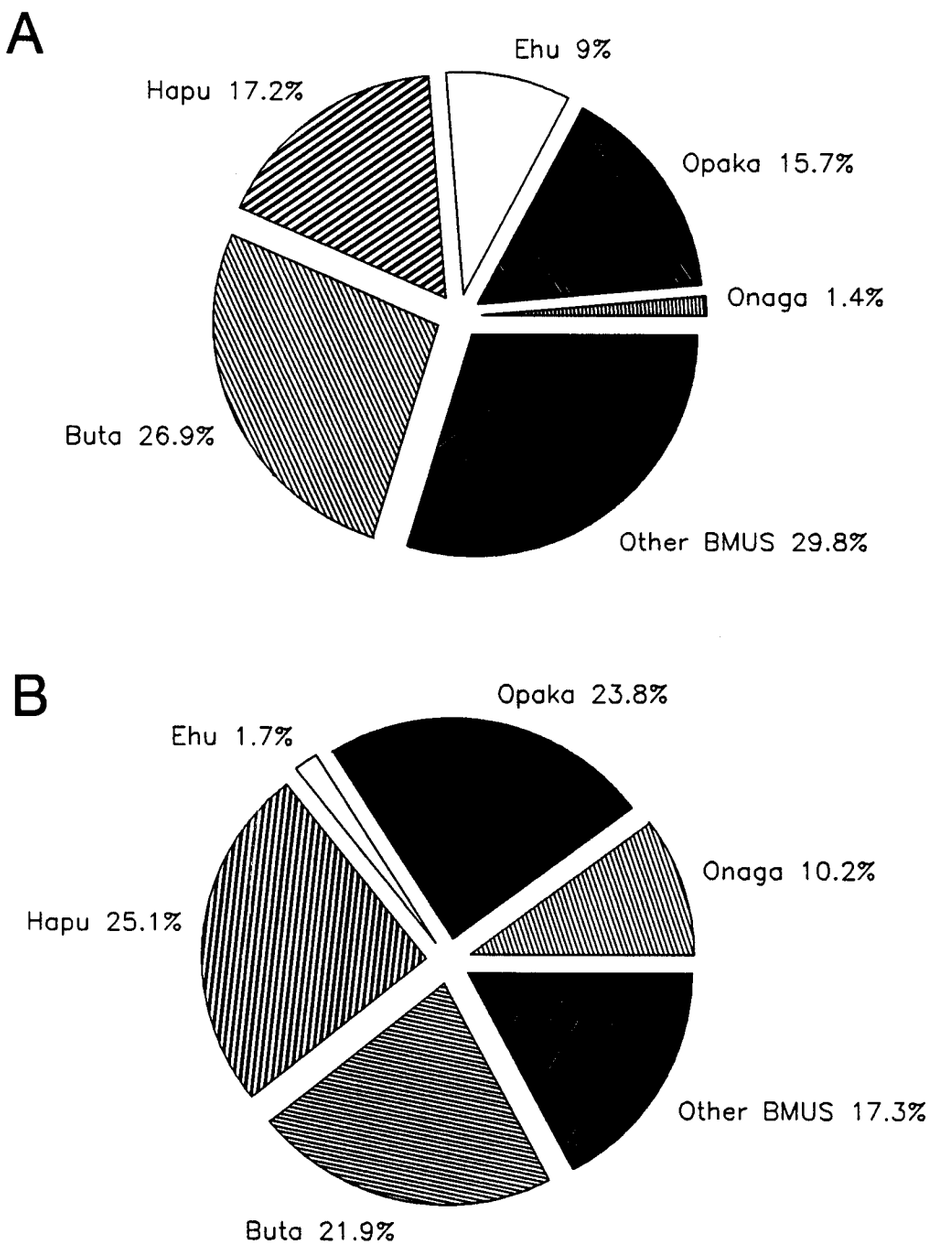

Figure 5.--Species composition of landings (by weight) of bottomfish management unit species landed in (A) the Mau Zone and (B) the Ho'omalu Zone in 1990.

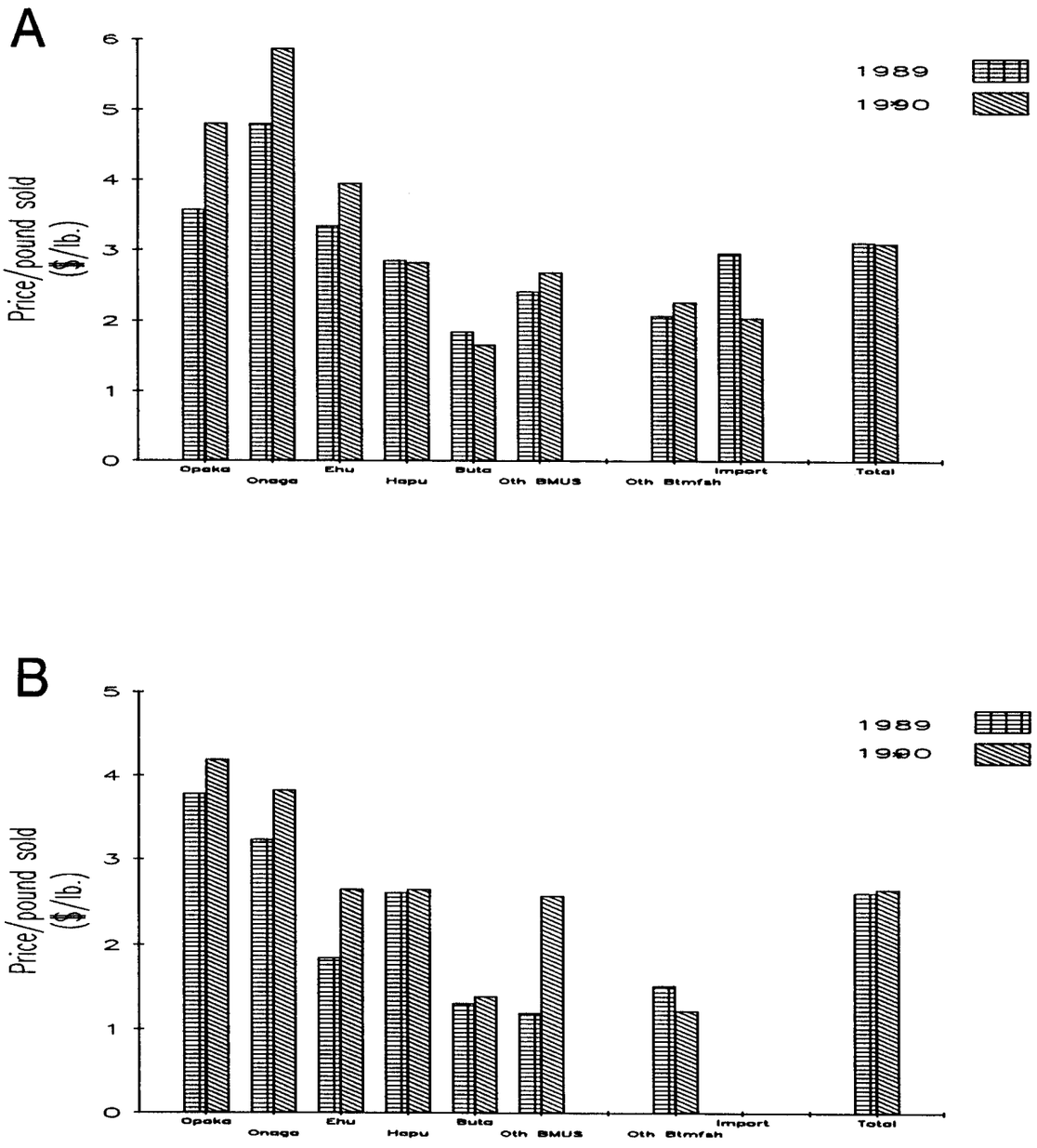

Figure 6.--Hawaii's 1989-90 market prices for bottomfish: (A) NWHI and MHI combined (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands) and (B) NWHI.

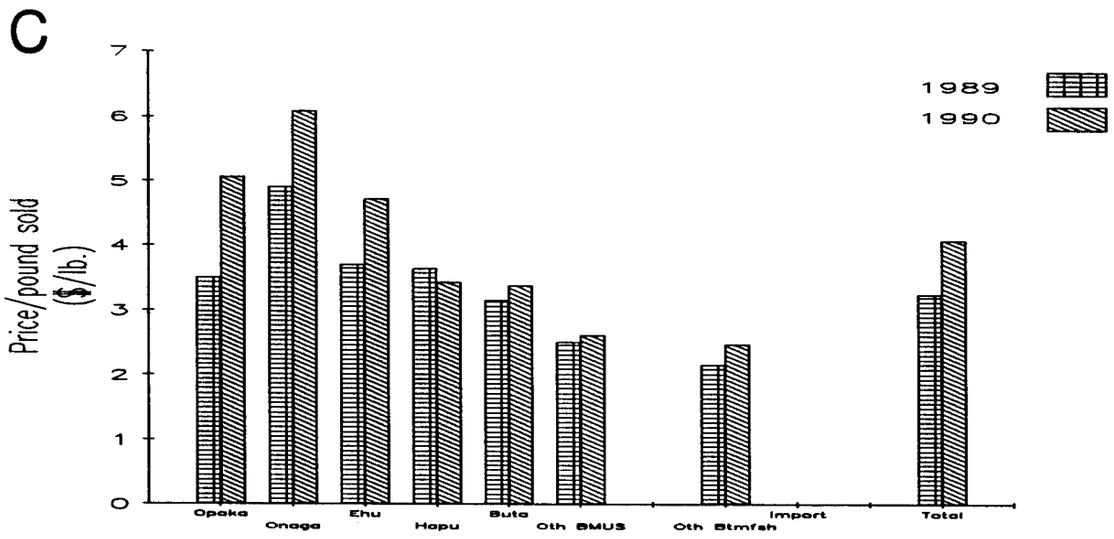

Figure 6.--Continued. (C) MHI.

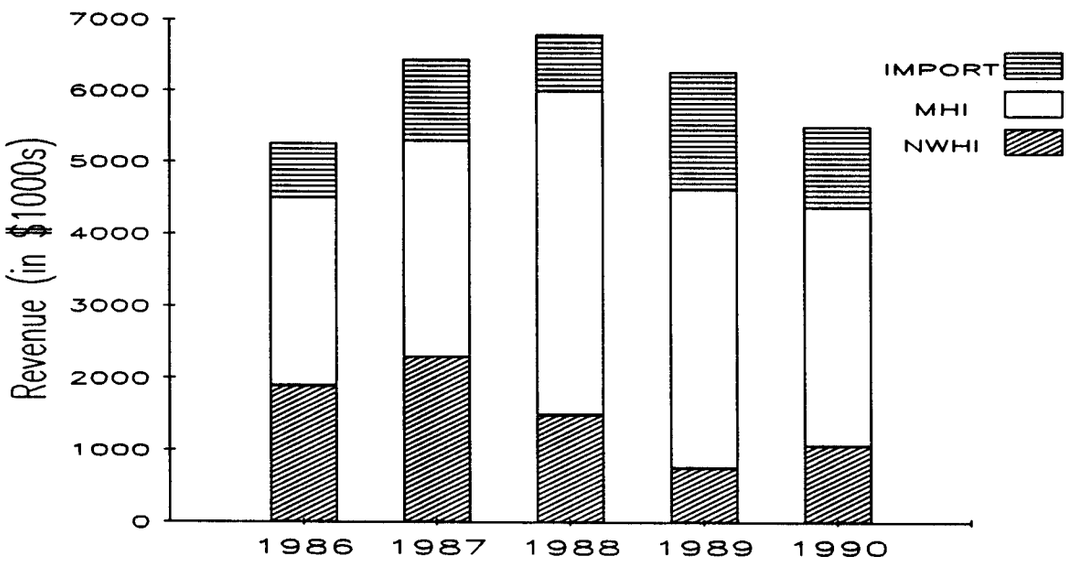

Figure 7.--Hawaii's bottomfish market revenue, 1986-90 (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands).

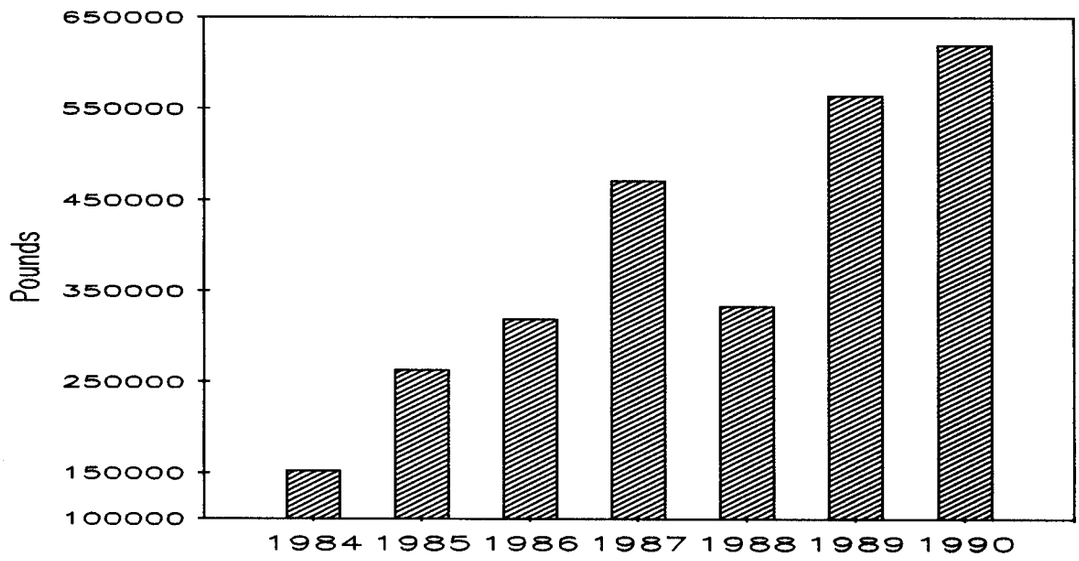

Figure 8.--Bottomfish imports to Hawaii, 1984-90.