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NORTHWESTERN HAWAIIAN ISLANDS BOTTOMFISH FISHERY, 1995

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OVERVIEW OF THE FISHERY

The National Marine Fisheries Service (NMFS) estimates that the 1995 Northwestern Hawaiian Islands (NWHI) total landings of bottomfish species were 369,000 pounds (Table 1) which is the lowest annual landing since 1989 (Tables 2 and 3). Total trips decreased to 130 for the fleet, while total vessels fishing was 15.

Vessels fishing the Ho'omalu zone (the limited access area, Fig. 1) increased by one vessel to six in 1995. However, the average number of trips per vessel declined to five per year, and the Ho'omalu zone landings continued its downward trend for the third consecutive year, decreasing 28% overall (Table 2). Bottomfish management unit species (BMUS) landings by species decreased across the board (Table 4). Opakapaka and hapuupuu landings both decreased 26% and uku decreased 48%. The Ho'omalu zone vessels continue to exploit nearly the entire Ho'omalu zone.

Mau zone (the open access area) participation decreased to 9 vessels. The average trips per vessel increased to 10, while fishing effort, in terms of total number of trips, decreased to 97 (Table 5). The catch for the Mau zone was the highest it has been since 1990, increasing its landings volume by 3.7%. The onaga landings sustained the highest increase (+136%) and uku landings increased 17%. The landings decreased for opakapaka (-36%), butaguchi (-26%), ehu (-25%), and all other BMUS (-27%)(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 1995. Monk seals, *Monachus schauinslandi*, also known to prey on hooked or released fish, were present in many of the areas fished. Levels of catch predation by all species remained variable with heavily fished areas continuing to have an abundance of predation while other less fished areas had little or none.

The intensity and frequency of the predation by sharks coupled with the known value of the fins has fueled attempts by many fishermen to switch to fishing for sharks when the problem becomes too severe. The level of directed shark fishing appears to be limited mainly to controlling the amount of predation on bottomfish. Bottomfishing activities resume after the sharks in the immediate area are controlled. There are no estimates of shark fin landings at this time.

The 1995 report is based on information from both NMFS and the Hawaii Division of Aquatic Resources (HDAR) data bases. This data base reflects the cooperation and close working ties between the two agencies. Joint monitoring of the fishery provides both agencies the information needed to manage the fishery. The composite data provides a more complete picture of the catch and

effort in the NWHI. HDAR's daily logbook was instituted in 1995 and has greatly improved the level of detail in the data.

FLEET OPERATIONS IN THE NWHI

General Fleet Operations

There were 33 permits issued in 1995 (27 permits in 1994) of which 15 vessels fished (Table 2, Fig. 2). Of the 15 active vessels, 10 fished on a regular basis (16 active vessels--6 on a regular basis in 1994). A total of 9 Ho'omalu permits were issued in 1995 of which only 6 Ho'omalu zone vessels fished (7 permits--5 active vessels in 1993) and 3 fished on a regular basis. Twenty-four permits were issued for the Mau zone of which 9 vessels were active (20 permits--12 active vessels in 1994) and 6 fished on a regular basis.

There were 130 trips made by 15 individual vessels throughout the NWHI (Table 2, Fig. 2). The fleet averaged 8 trips per vessel while the number of trips for an individual vessel ranged from 1 to 22. The areas fished ranged from Nihoa Island to Kure Atoll. The average trip length, based on monitoring, was 14 days with 7 days of fishing (n = 99 trips) compared with 18 days and 8.5 days of fishing (n = 49 trips) in 1994. The number of trips and fishing effort is reflective of the large increase in the effort information from the Mau zone. Comparisons of trip operations and landings by management areas for 1991-94 are shown in Table 6. These results were based on data from NMFS sources though 1994 and on data from NMFS and HDAR sources in 1995.

Ho'omalu Zone Fleet Operations

There were six vessels that fished the Ho'omalu zone, only three of which fished regularly. There were 33 trips made with an average of 5 trips per vessel (Table 5, based on NMFS-HDAR data). The number of trips made per vessel ranged from 1 to 10. The areas fished ranged from French Frigate Shoals to Kure Atoll. Most of the fishing activities were centered in the St. Rogatien bank to Lisianski Island area.

The average trip lasted 25.5 days with 10.8 days of fishing. The average trip length has increased by 3.5 days as the number of days fished (Table 6) has remained relatively unchanged. This indicates that on the average, the vessels used more travel days per trip while fishing approximately the same number of days to bring in less catch.

Mau Zone Fleet Operations

The number of vessels fishing in the Mau zone decreased. Nine vessels made 97 trips in 1995 (NMFS-HDAR data). Fishing effort, in terms of number of trips, nearly equaled last year's total (Table 2). On a per-trip basis, the effort decreased (Table 6) both in

terms of days fished per trip as well as in total days per trip. Mau zone fishing trips averaged 8.5 days with 5 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 State of Hawaii Division of Aquatic Resources (HDAR) and the Fishery Monitoring and Economics Program (FMEP) from the NMFS Honolulu Laboratory. Most of the landings are monitored at the largest seafood auction in Hawaii. The auction sells the majority of the fish caught by the large-scale, full-time commercial bottomfish fishermen.

The total bottomfish landings for the NWHI decreased to a 6-year low (Tables 2, 3, and 7). BMUS accounted for 73% of the total landings (1994 = 85%). Species landings composition by weight for the NWHI is provided in Table 7 (and by zones in Table 4 and per trip by zones in Table 9). Overall landings have decreased with opakapaka landings (Fig. 3) remaining as the largest component but decreasing by 27%. Onaga, being the only species to show an increase in landings, rose 23%. Opakapaka landings were the highest followed by uku, hapuupuu, onaga, and butaguchi. Other BMUS, other bottomfish, and ehu made up the remainder of the landings.

Despite a decline in catch of nearly 4%, uku remained the second most common species. Uku catches appear to be extremely variable both temporally and spatially (Tables 4, 7, and 8). It is interesting to note that uku has made up a large component of the NWHI landings only since 1990. Previous to 1990, there were minimal landings.

There is very little known of the biology and movement of this species. It is not known if the increase in landings was due to targeting or if the stock of mature fish suddenly appeared from somewhere else. The landings of uku in the MHI has in the past appeared to be cyclical, or at least highly variable from year to year, and also highly seasonal. Pending any kind of research project, the mystery of the uku will continue in the NWHI as well as in the main Hawaiian Islands (MHI).

Ho'omalu Zone Landings

Ho'omalu zone BMUS landings were down by 28%. Opakapaka landings were the highest (Fig. 4) followed by hapuupuu, onaga, butaguchi, uku, other BMUS, and ehu. The Ho'omalu zone average landings per trip were 6,595 pounds, of which 6,130 pounds (92%) were BMUS (Table 5, Fig. 5, NMFS-HDAR data). The average BMUS landings per trip decreased by 11%; most of the decreases can be attributed to uku, ehu, hapuupuu, and opakapaka (Table 8, Fig. 6).

Landings volume of butaguchi in the Ho'omalu zone does not necessarily reflect actual catch volume. Data from the observer program have indicated that, in the past, as many as half or more of the butaguchi caught in the Ho'omalu zone were released. Butaguchi releases are not generally size dependent but rather predicated upon shelf life and value. A similar percentage of large white ulua are also released, mostly because of market preferences for smaller fish. Since butaguchi and white ulua are of relatively low value, neither is targeted at the start of the trip. They are used as fillers or to "make weight" later in the trip to offset any shortfalls in the volume of the target species. Most fishermen have been releasing these fish alive. Kahala have zero market value due to implication with ciguatera and are perceived to be in competition with the opakapaka for resources. They 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 amount of fishing mortality caused by capture stress and post-release predation may or may not combine to show an adverse effect on the health of the stocks. Bottomfish release information, as well as any associated mortality estimates, is needed to improve the annual assessment of the NWHI bottomfish stocks.

MAU ZONE LANDINGS

The Mau zone landings have risen since 1992, and BMUS landings have increased 1.6% over 1994 landings. Landings per trip averaged 2,787 pounds of which 1,634 pounds (58%) were BMUS. The BMUS catch per trip increased 3.7% while the overall catch per trip increased by 22%. The landings were led by uku (Tables 4, and 8, Fig. 5), followed by onaga, butaguchi, hapuupuu, opakapaka, other BMUS, and ehu. The landings composition has changed over the years with fishermen targeting uku and onaga as opposed to the traditional target species, opakapaka (Fig. 7). Fishermen are, after all, opportunists catching whichever species is the most abundant at the time.

BOTTOMFISH PRICES

The 1995 average prices for NWHI bottomfish have decreased for all of the major BMUS, the largest decreases being for onaga and opakapaka, the premier restaurant fishes (Table 10, Figure 8). Only uku and other BMUS experienced a minimal price increase. The price fluctuations were within range of the average prices for the last few years. The value of these fishes is maintained by the demand from hotels and restaurants that cater to Hawaii's visitor industry. The price structure is also affected by the lower value of imported bottomfish species and the variability of the visitor industry.

The 1995 overall market prices for bottomfish (all sources) in Hawaii have also sustained a decrease (Table 9, Figs. 8, 9, and

10). The decrease in market prices, coupled with the decrease in landings, has resulted in a 10% decrease in bottomfish revenue (Table 10).

Although the data on volume and value of imported bottomfish were unavailable for 1995, the trend for import volume has been increasing at a slow but steady rate. In the past, the volume of bottomfish imported into Hawaii had surpassed the NWHI landings, and has been more than the MHI landings since 1992 (Fig. 11). The average price per pound of the imported bottomfish (Table 9) has been estimated to have fluctuated little over the last few years, and on a species by species comparison basis, it is below local values. The acceptable and improving quality of the imports--mainly onaga, ehu, and opakapaka--coupled with the lower prices, enables 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 imported bottomfish.

Although MHI bottomfish continue to be at the high end of the market price structure, they too have experienced a decrease in price. Hapuupuu and butaguchi are the only members of the top six species to have increased in price.

RECOMMENDATIONS

Tag and release has been proven by the State of Hawaii to be a viable tool in research on certain deepwater species. Their success in the MHI in tagging and releasing opakapaka coupled with a good recovery rate indicates that it is a feasible fisheries research tool. Preliminary indications from the state program are that opakapaka are not restricted to any one bank or island area. They do indeed cross deep channels between islands. This fact has never before been proved and will greatly affect many fisheries management decisions in the future.

Based on the success of the State of Hawaii's tag and release program, the NMFS should consider the possibility of a complementary program for bottomfish species in the NWHI. Such a program could provide basic information on the life history of the bottomfish species. Information on the movement and growth would enable fishery managers to consider different management options which may be more effective.

Information on the movement of bottomfish species in the NWHI would provide information for a decision on the possibility of bank-by-bank management, including closed areas or rotating bank openings. Movement or migration across deepwater channels may indicate a need to combine the Mau and Ho'omalu zones. Movement on a more extensive scale may indicate that an archipelago-wide management plan may be in order (biologically speaking). If movement between the MHI and the NWHI is occurring, then SPR values

may have to be reevaluated. The spread of taape to the NWHI from the MHI demonstrates that movement (larval or adult) can and does occur. The recapture of a kahala, tagged at Necker island by the NMFS and recovered 2 years later at Laie Point, Oahu by a shore caster, shows adult movement in the opposite direction. Electrophoretic work on selected bottomfish has shown no significant differences between the MHI and the NWHI stocks.

NWHI fishermen have supported and requested research on bottomfish. Many of them have volunteered to tag fish that are to be released. They have indicated that they would forgo any reward other than knowing the location of the recaptures and the overall fish movements. The cumulative number of bottomfish released by fishermen during a trip is substantial at times. In these times of budgetary constraints on bottomfish research, the fishermen could provide a low cost, low maintenance tagging program that could yield critical data for use in management decisions and could establish a positive relationship between the fishermen and researchers.

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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.--NWHI bottomfish landings (1,000 pounds, not including pelagic species), active vessels and trips, 1986-95.

Area	1986[a]	1987[a]	1988[a]	1989[a]	1990[a]	1991[b]	1992[b]	1993[b]	1994[b]	1995[b]
LANDINGS										
Mau	NA	NA	NA	118	249	103	71	98	160	166
Ho'omalu	NA	NA	NA	184	173	283	353	287	283	202
TOTAL LANDINGS	869	1015	626	303	421	387	424	385	443	369
VESSELS										
Mau	NA	NA	4	5	14	14	8	8	12	9
Ho'omalu	NA	NA	12	5	5	4	5	4	5	6
TOTAL VESSELS	24	28	13[c]	10	16[c]	17[c]	13	12	16[c]	15
TRIPS										
Mau	NA	NA	21	22	55	84	55	72	99	97
Ho'omalu	NA	NA	72	28	25	47	37	34	41	33
TOTAL TRIPS	163	134	93	50	80	131	92	106	140	130

[a]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 3.--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, 1989-95. Columns may not total because of rounding and landings not enumerated by source. This table is updated on a regular basis as the information becomes available.

Source	1989	1990	1991	1992	1993	1994	1995
Market Landings (in 1,000 lb sold)							
NWHI	303	421	387	424	385	443	369
MHI	1,007	652	562	587	463	536	561
HAWAII TOTAL	1,314	1,092	983	1,043	862	1,011	964
Imports[a]	564	620	479	634	550	642	N/A
Total bottomfish	1,878	1,712	1,462	1,677	1,412	1,653	N/A
Revenue (in US$1,000)							
NWHI	750	1,070	1,000	1,255	1,164	1,382	1,260
MHI	3,090	2,265	1,713	1,842	1,535	1,792	1,802
HAWAII TOTAL	3,840	3,335	2,713	3,097	2,699	3,276	2,941
Imports[a]	1,396	1,546	1,300	1,869	1,643	2,003	N/A
Total bottomfish	5,236	4,881	4,013	4,966	4,342	5,279	N/A

[a]U.S. Customs data compiled by NMFS.

Table 4.--Northwestern Hawaiian Islands bottomfish management unit species (BMUS) landings composition (1000 pounds) by area for 1991[a], 1992[a], 1993[a], 1994[a], 1995[a].

	1991		1992		1993		1994		1995	
Species	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu
Opakapaka	13	71	26	118	27	130	22	122	14	90
Onaga	6	39	6	16	4	35	11	31	26	27
Ehu	14	5	2	5	4	6	8	7	6	1
Hapuupuu	15	42	6	51	15	44	14	54	14	39
Butaguchi	19	56	18	61	29	34	34	26	25	21
Uku	22	46	5	80	8	25	52	25	61	13
White ulua	<1	11	0	12	0	5	<1	9	<1	4
Other BMUS	7	2	3	3	4	4	11	16	8	3

[a]Data from combination of NMFS and HDAR data sets.

Table 5.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (Mau and Ho'omalu Zones) using the combination NMFS and HDAR data set for 1992-95.

	1992		1993	
	Mau	Ho'omalu	Mau	Ho'omalu
Vessels (No.)	8	5	8	4
Trips (No.)	55	37	72	34
Trips/vessel (No.)	6	7	9	8
BMUS/trip (lb)	1,275	9,468	1,323	8,414
Total catch/trip[a] (lb)	1,690	9,954	1,547	8,584
Revenue/trip[a] (US$)	4,754	28,977	4,736	25,553
Revenue/vessel[a] (US$)	32,687	214,430	42,624	217,208

	1994		1995	
	Mau	Ho'omalu	Mau	Ho'omalu
Vessels (No.)	12	5	9	6
Trips (No.)	99	41	97	33
Trips/vessel (No.)	8	8	10	5
BMUS/trip (lb)	1,575	6,908	1,634	6,130
Total catch/trip[a] (lb)	2,279	7,059	2,787	6,595
Revenue/trip[a] (US$)	6,127	22,010	6,169	18,666
Revenue/vessel[a] (US$)	75,832	180,485	66,498	102,664

[a]Includes all fish caught.

Table 6.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (Mau and Ho'omalu Zones), 1991-95[a] (BMUS = bottomfish management unit species). Data are compiled from trips which have complete effort information available.

	1992		1993		1994		1995	
	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu
Vessels (No.)	5	5	8	4	8	5	8	6
Trips (No.)	42	36	56	32	42	38	68	31
Trips/vessel (No.)	8	7	7	8	5	7	8	5
Days at sea	399	677	520	662	453	851	580	792
Days fished	243	414	274	364	252	425	347	335
Day fished/trip	5.8	11.5	4.9	11.4	6	11.2	5.1	10.8
Days/trip	9.5	18.8	9.3	20.7	10.8	22.4	8.5	14.7
BMUS/trip (lbs.)	1388	7393	1312	8248	2128	7068	1563	6294
Tot. catch/trip (lbs.)	1786	7726	1484	8417	2432	7196	2459	6670
BMUS/fishing day (lbs.)	239	639	267	723	353	629	306	582
Tot. catch/fishing day (lbs.)	308	668	302	738	403	640	481	617
Revenue/trip ($US)	4,941	22,309	4,667	25,114	7,082	22,591	6,335	21,583
Revenue/vessel ($US)	41,505	160,626	32,675	200,918	12,768	171,692	53,851	111,516

[a]Information from 1991-94 is from NMFS-monitored trips only and may not match those in Table 3 due to rounding and extrapolation. Data for 1995 is a combination of NMFS and HDAR data.

Table 7.--Species composition of bottomfish landings in the Northwestern Hawaiian Islands, 1988-95 (BMUS = bottomfish management unit species). Data values may not match Table 3 due to a difference in data sources.

Catch (in 1000 pounds)

Species	1989	1990	1991[a]	1992[a]	1993[a]	1994[a]	1995[a]
Opakapaka	112	79	86	145	158	145	105
Onaga	13	21	46	23	40	43	53
Ehu	9	25	20	8	11	15	8
Hapuupuu	66	85	59	57	60	69	54
Butaguchi	57	103	75	79	64	61	47
Uku	5	60	69	86	33	78	75
Other BMUS	39	42	22	22	15	27	18
Total BMUS[b]	302	415	377	420	381	438	360
Other bottomfish	1	8	10	4	4	5	9
Total bottomfish[b]	303	423	387	424	385	443	369

Value (in U.S. $1000)

Species	1989	1990	1991[a]	1992[a]	1993[a]	1994[a]	1995[a]
Opakapaka	416	322	304	577	591	592	372
Onaga	40	77	206	89	131	186	187
Ehu	16	63	54	20	36	47	33
Hapuupuu	158	194	148	146	167	195	157
Butaguchi	71	137	89	119	107	102	74
Uku	NA	NA	204	269	99	204	198
Other BMUS	50	261	36	28	27	46	27
Total BMUS[b]	753	1,057	1,040	1,250	1,158	1,372	1,048
Other bottomfish	2	9	13	5	6	10	12
Total bottomfish[b]	756	1,066	1,053	1,255	1,164	1,382	1,060

[a]Combination NMFS-HDAR data set.
[b]Totals may not sum due to rounding.

Table 8.--Northwestern Hawaiian Islands bottomfish management unit species (BMUS) landings composition per trip, 1992[a], 1993[a], 1994[a], 1995[a].

	1992		1993		1994		1995	
Species	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu	Mau	Ho'omalu
Opakapaka	448	3208	382	3849	229	2984	149	2741
Onaga	124	450	66	1042	114	771	270	825
Ehu	48	148	69	185	81	172	65	47
Hapuupuu	121	1386	210	1305	150	1318	153	1206
Butaguchi	336	1660	415	1004	346	655	264	665
Uku	100	2187	112	736	529	623	635	397
Other BMUS	56	425	67	291	124	381	99	249
Total per trip[b]	1,273	9,464	1,321	8,412	1,573	6,904	1,635	6,130

[a]Data from combination of NMFS and HDAR data sets.
[b]Data may not match Table 3 due to rounding.

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]
		1992			**1993**	
Opakapaka	4.08	3.98	4.16	3.99	3.74	4.28
Onaga	5.24	3.87	5.69	5.03	3.27	6.18
Ehu	3.72	2.51	4.07	4.06	3.27	4.45
Hapuupuu	2.74	2.57	3.43	2.86	2.78	3.25
Butaguchi	1.56	1.51	3.32	1.74	1.67	2.75
Uku	1.46	3.13	3.31	3.13	3.01	3.19
Other BMUS	1.74	1.29	2.55	1.55	1.83	1.50
Other bottomfish	2.28	1.33	1.77	2.10	1.50	2.17
Imports[d]	2.96			3.02		
Total bottomfish	1.97	2.96	3.91	3.33	3.02	3.60
		1994			**1995**	
Opakapaka	4.02	4.08	3.92	3.65	3.69	3.84
Onaga	5.51	4.33	6.47	4.95	3.50	6.06
Ehu	3.70	3.13	4.25	4.00	3.01	4.02
Hapuupuu	2.85	2.83	3.34	3.00	3.03	3.79
Butaguchi	1.72	1.67	1.93	1.69	1.52	2.45
Uku	2.81	2.62	2.98	2.72	2.66	2.79
Other BMUS	1.47	1.70	1.40	1.38	1.88	1.35
Other bottomfish	1.79	2.00	1.77	1.78	1.78	1.85
Imports[d]	3.12			3.01		
Total bottomfish	3.24	3.12	3.34	3.05	3.01	3.21

[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, 1970-95, based on data from the Hawaii Division of Aquatic Resources (1970-78) and NMFS estimates (1979-95).

Year	Landings (x 1000 lb)	Revenue (x $1000)	Price ($US/lb.[a])
1970	344	253	3.00
1971	410	312	2.99
1972	407	366	3.42
1973	454	418	3.35
1974	413	421	3.35
1975	549	584	3.20
1976	558	693	3.56
1977	562	764	3.70
1978	740	1,100	3.77
1979	809	1,296	3.66
1980	856	1,218	2.90
1981	993	1,794	3.34
1982	1,162	2,177	3.26
1983	1,424	3,233	3.84
1984	1,481	3,192	3.53
1985	1,717	3,853	3.48
1986	1,682	3,958	3.57
1987	1,819	4,687	3.72
1988	1,794	4,796	3.64
1989	1,314	3,867	3.86
1990	1,058	3,371	3.91
1991	984	2,864	3.30
1992	1,043	3,199	3.32
1993	862	2,749	3.34
1994	1,011	3,277	3.29
1995	964	2,942	3.05

[a]Inflation adjusted prices, 1995 base year.

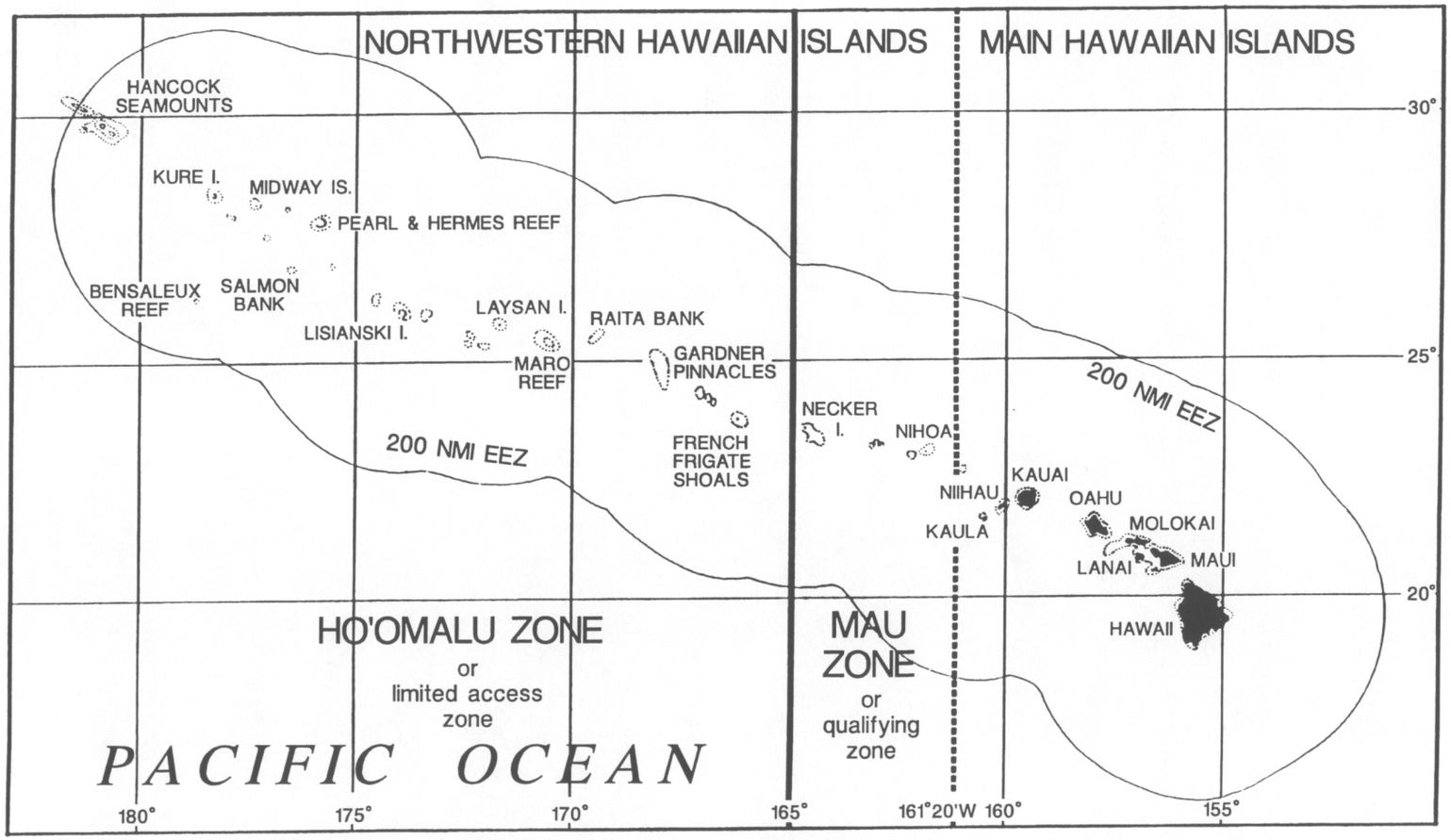


Figure 1.--Map of the Northwestern Hawaiian Islands.

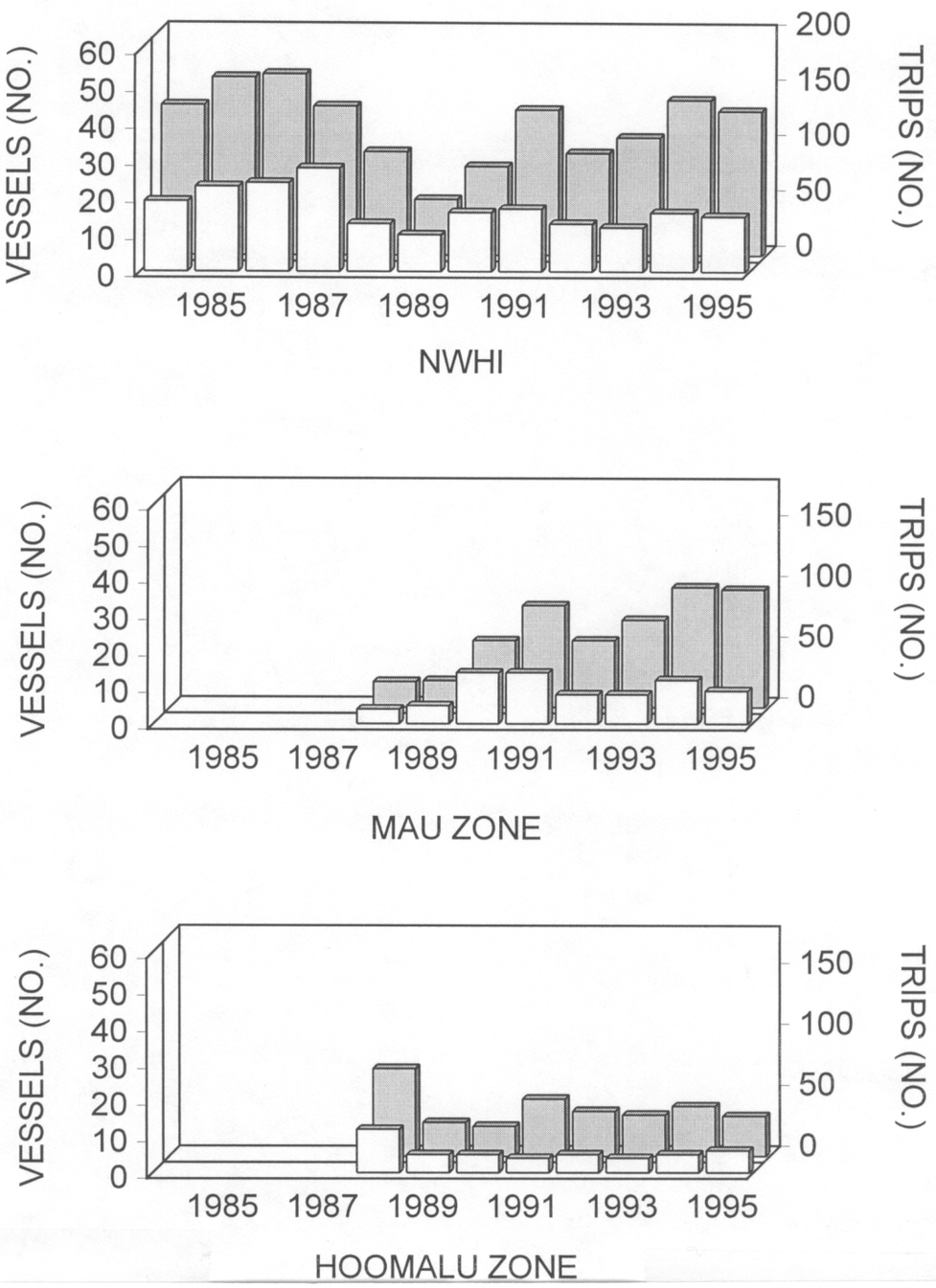


Figure 2.--NWHI bottomfish fleet activity, vessels (foreground) and trips (background): Total (top), Mau (middle), and Ho'omalu Zones (bottom).

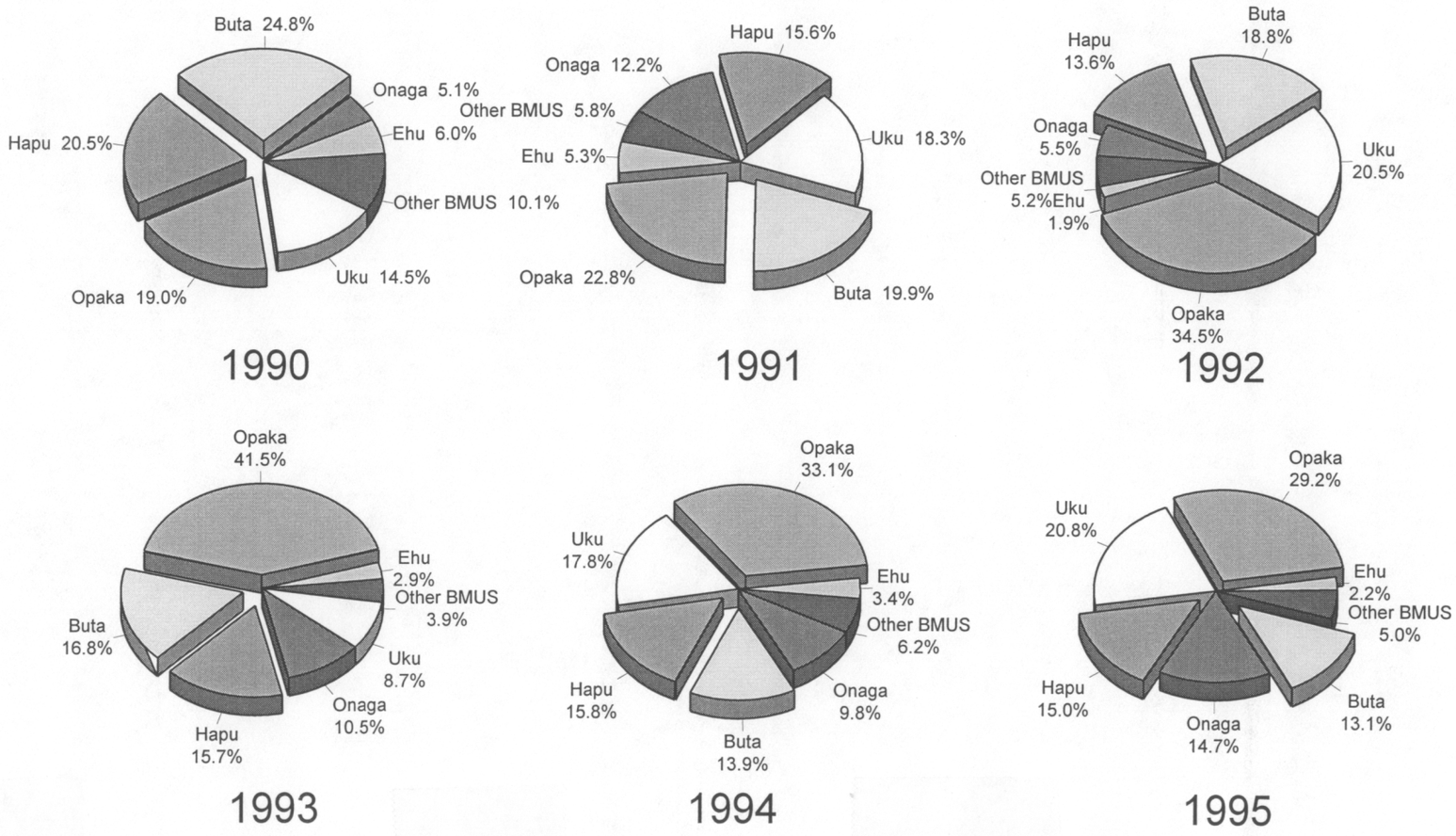


Figure 3.--Composition of bottomfish management unit species landings in the Northwestern Hawaiian Islands, 1990-95.

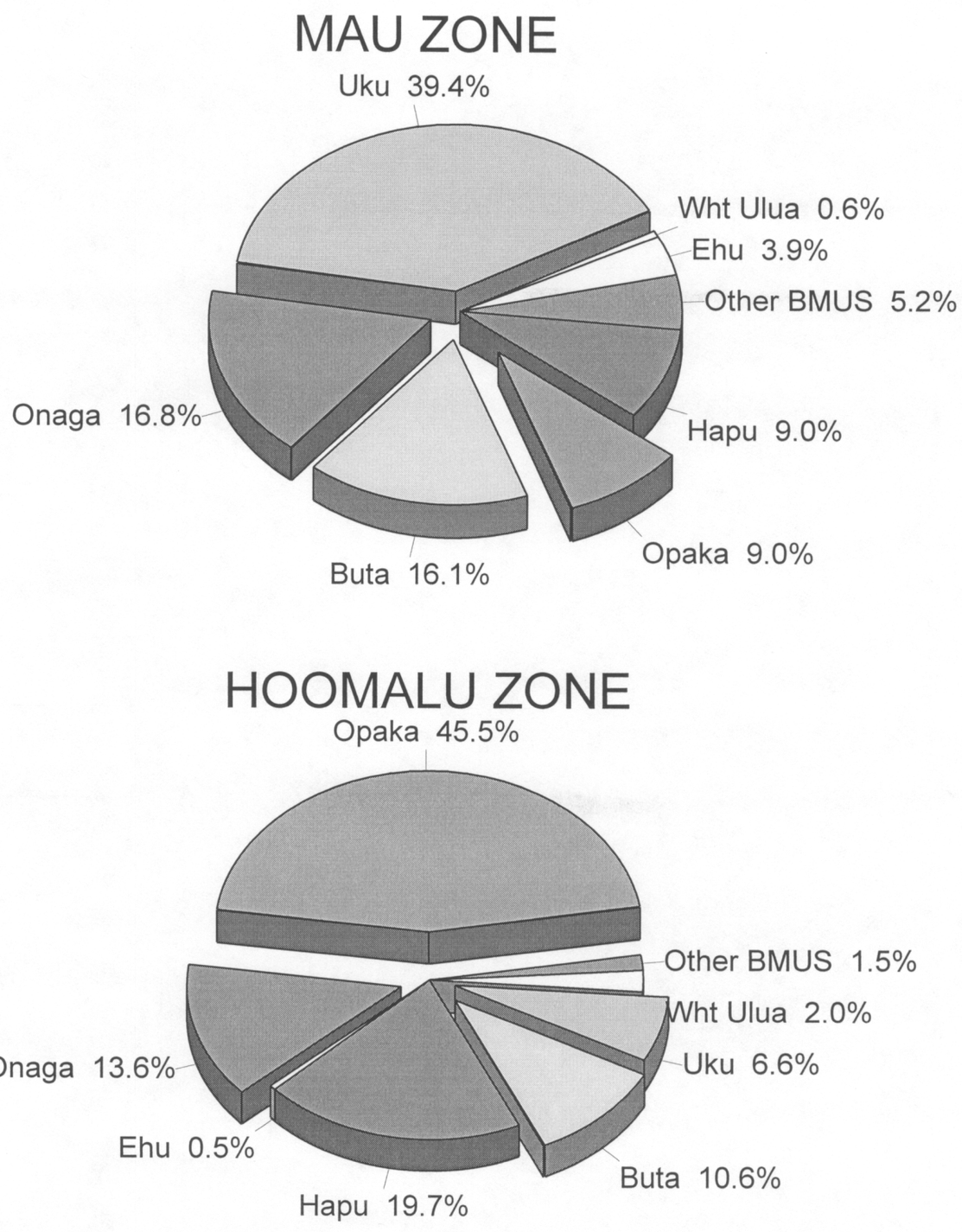
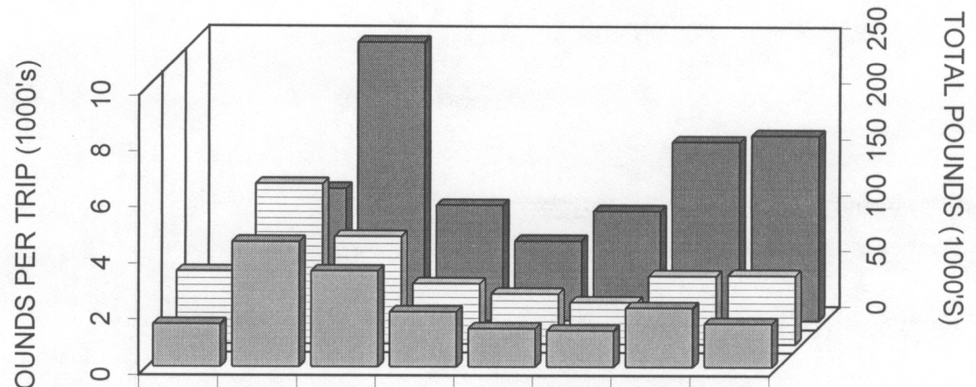


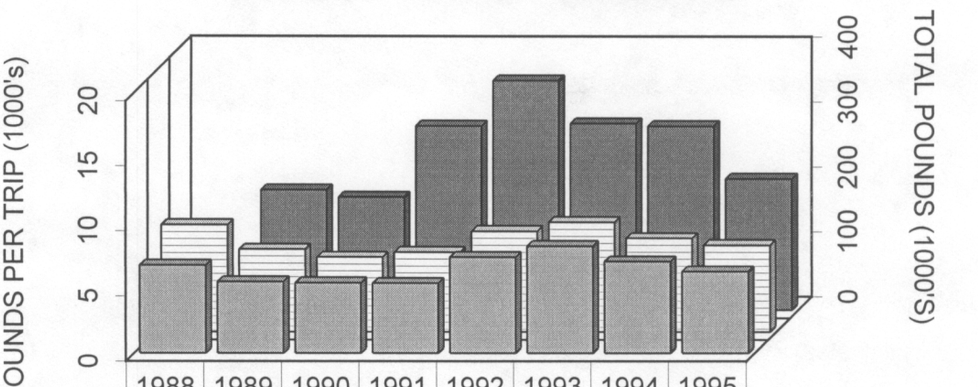
Figure 4.--Composition of BMUS landings by weight for 1995, Mau Zone (top) and Ho'omalu Zone (bottom).

Mau Zone



	1988	1989	1990	1991	1992	1993	1994	1995
BMUS LBS/TRIP	1.53	4.467	3.438	1.976	1.388	1.312	2.128	1.563
TOTAL LBS/TRIP	2.596	5.719	3.82	2.151	1.786	1.484	2.432	2.459
TOTAL LBS	NA	118	249	103	71	98	160	166

Hoomalu Zone



	1988	1989	1990	1991	1992	1993	1994	1995
BMUS LBS/TRIP	6.754	5.483	5.406	5.368	7.393	8.248	7.068	6.294
TOT LBS/TRIP	8.194	6.318	5.715	6.112	7.726	8.417	7.196	6.67
TOT LBS	NA	184	173	283	353	287	283	202

Figure 5.--NWHI BMUS and total catch per trip: Mau and Ho'omalu Zones, 1988-95. Data are based on trips for which total effort information were available.

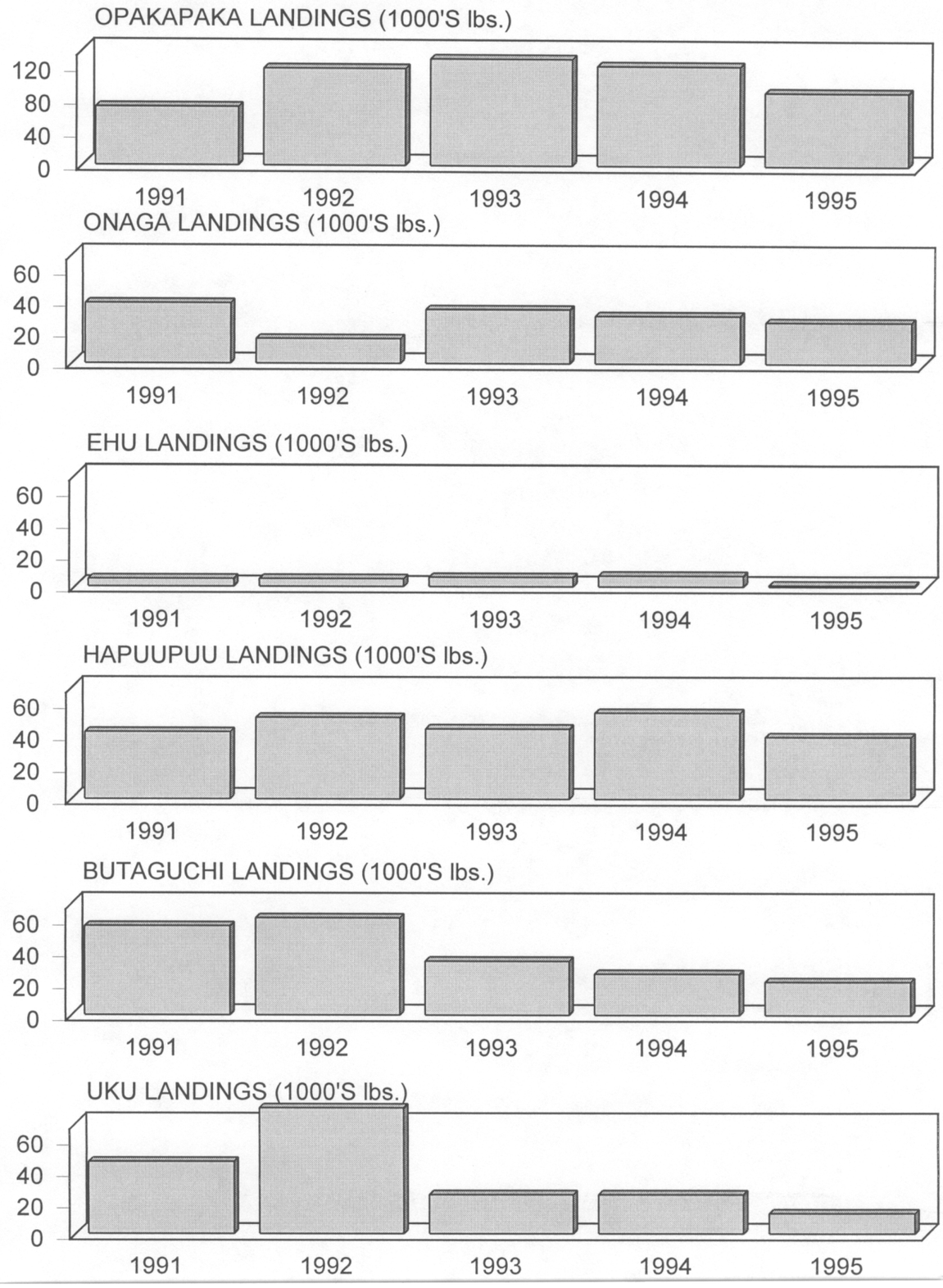


Figure 6.--Ho'omalu Zone landings of selected species, 1991-95.

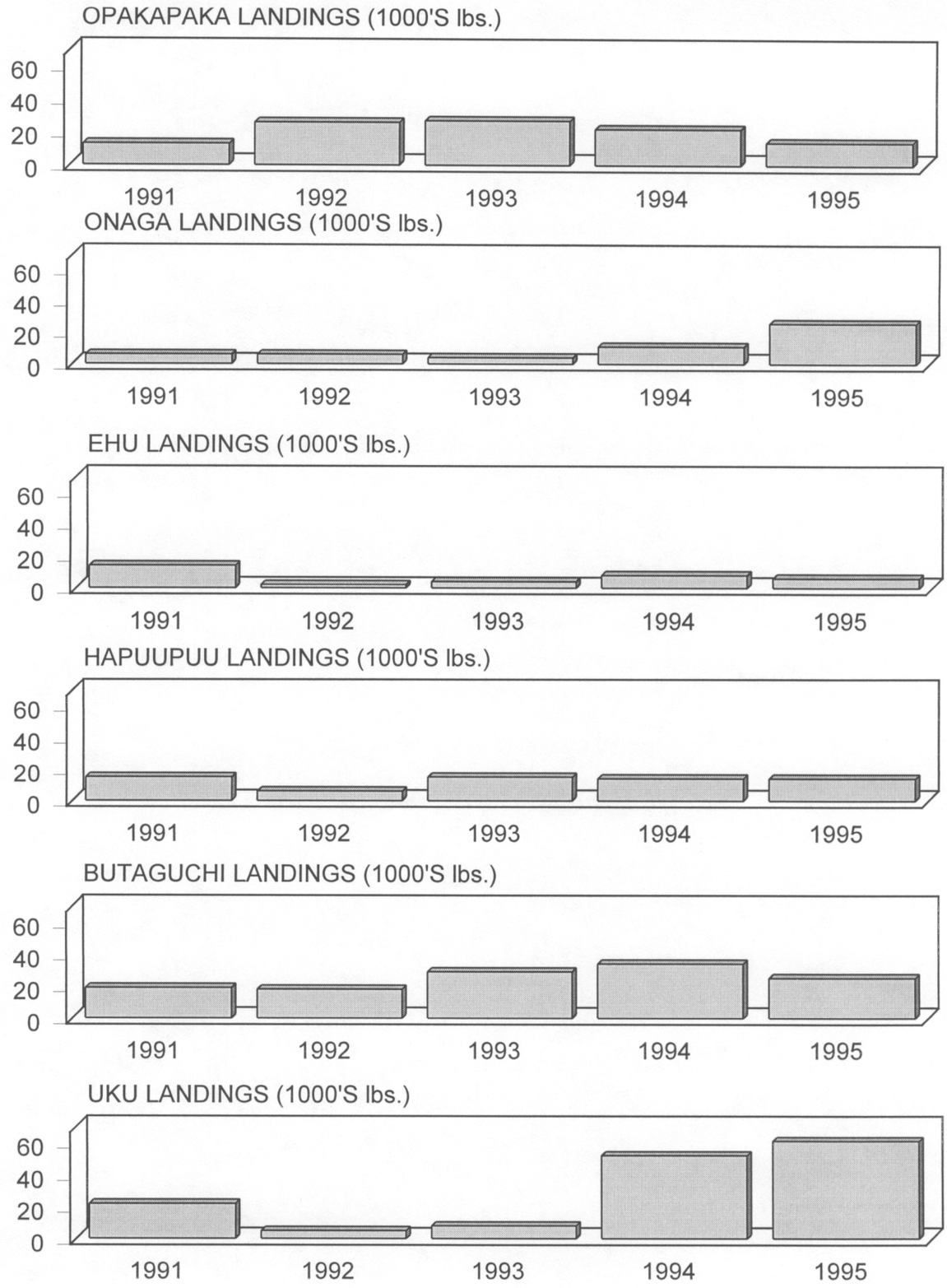
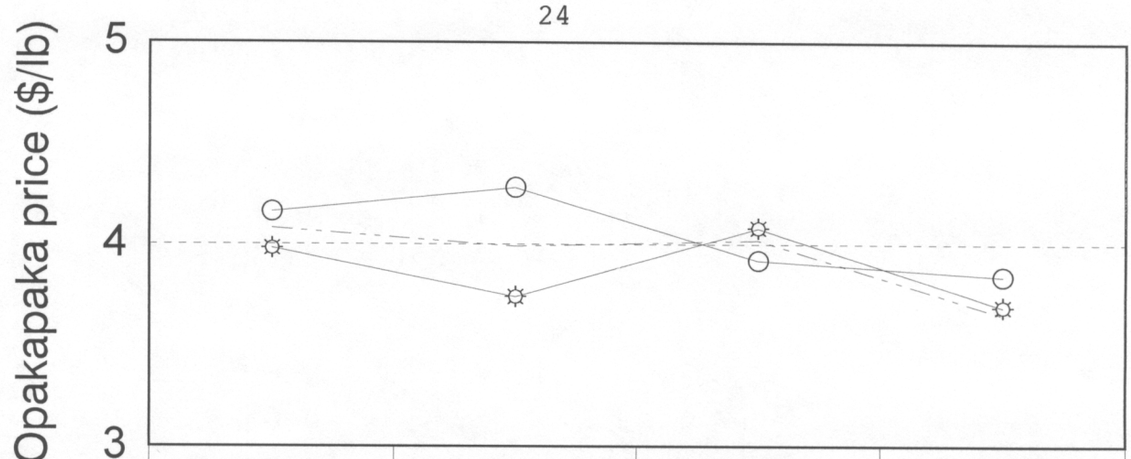
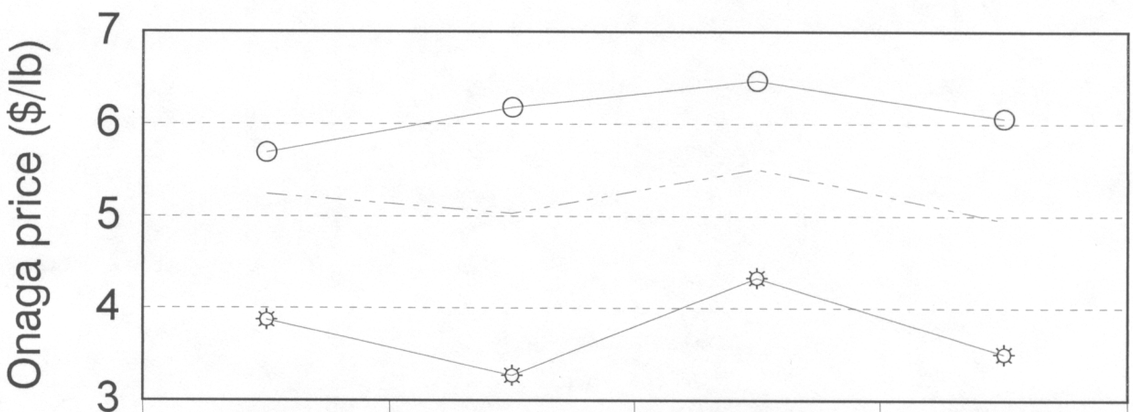


Figure 7.--Mau Zone landings of selected species, 1991-95.

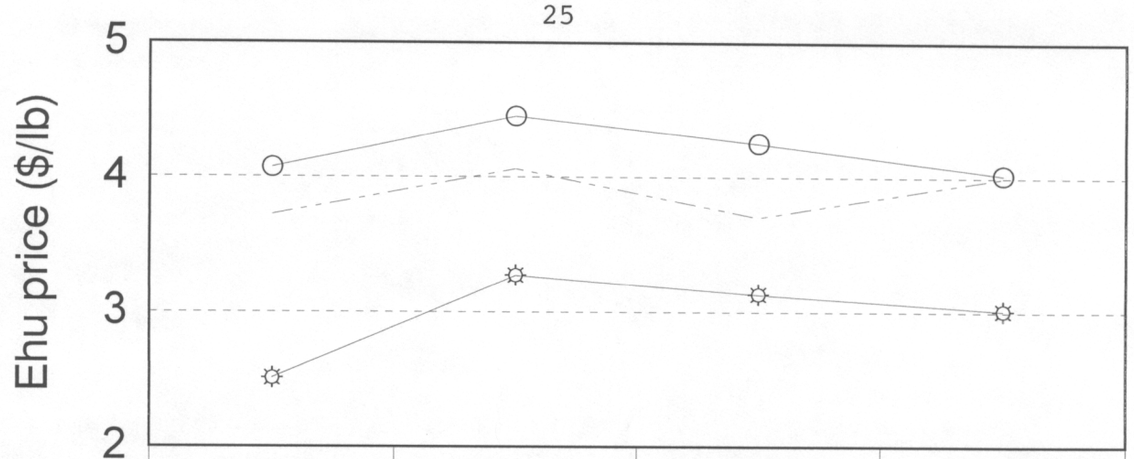


	1992	1993	1994	1995
MHI	4.16	4.28	3.92	3.84
NWHI	3.98	3.74	4.08	3.69
MARKET	4.08	3.99	4.02	3.65

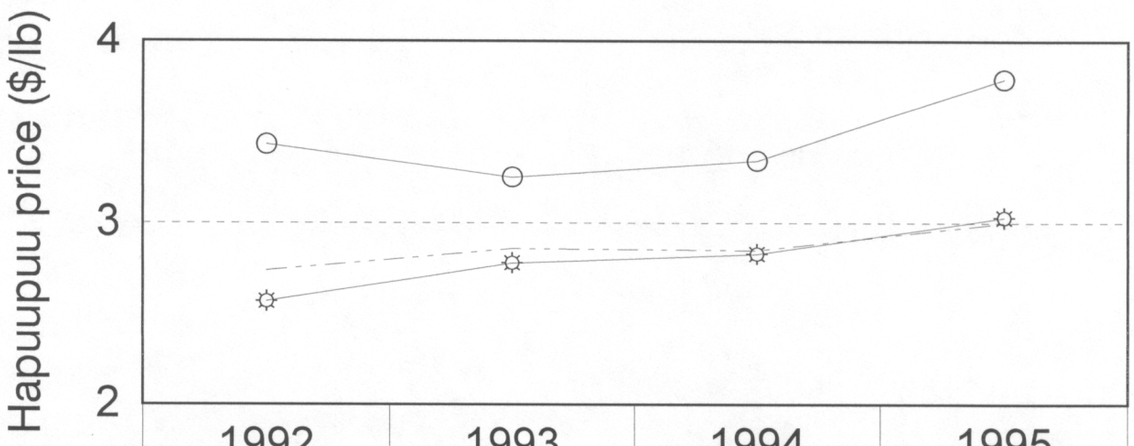


	1992	1993	1994	1995
MHI	5.69	6.18	6.47	6.06
NWHI	3.87	3.27	4.33	3.5
MARKET	5.24	5.03	5.51	4.95

Figure 8.--Hawaii's market prices for Opakapaka and Onaga, 1992-95.

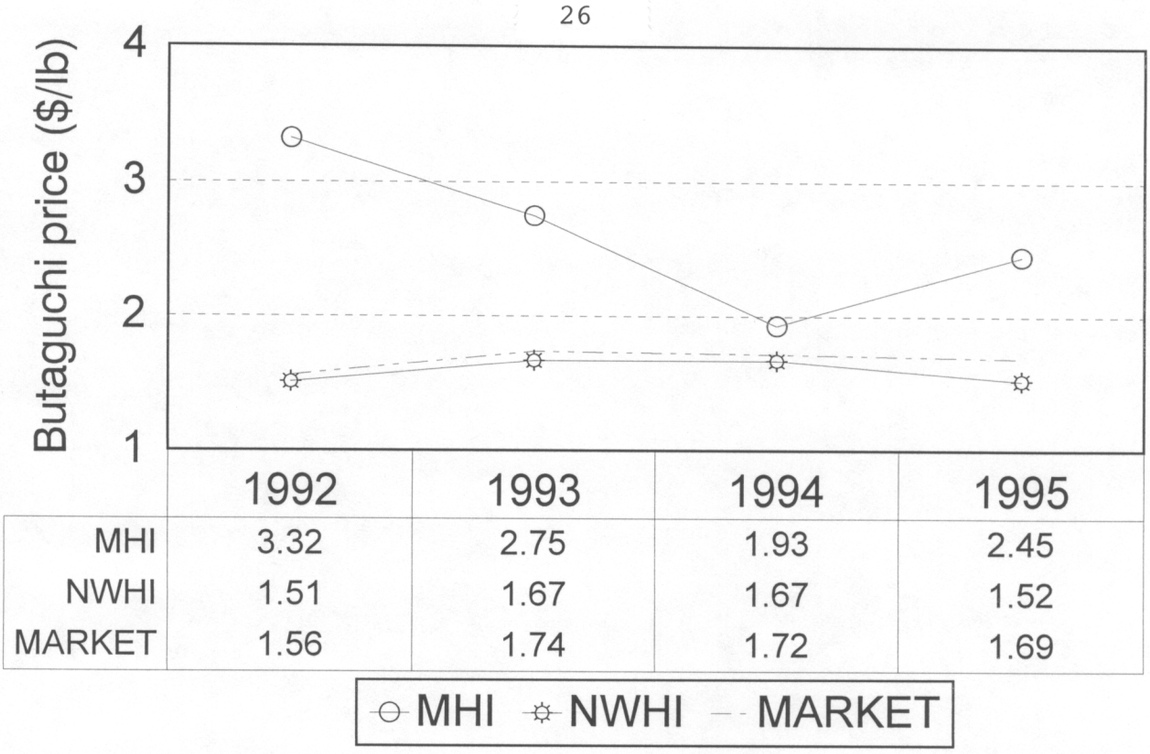


	1992	1993	1994	1995
MHI	4.07	4.45	4.25	4.02
NWHI	2.51	3.27	3.13	3.01
MARKET	3.72	4.06	3.7	4

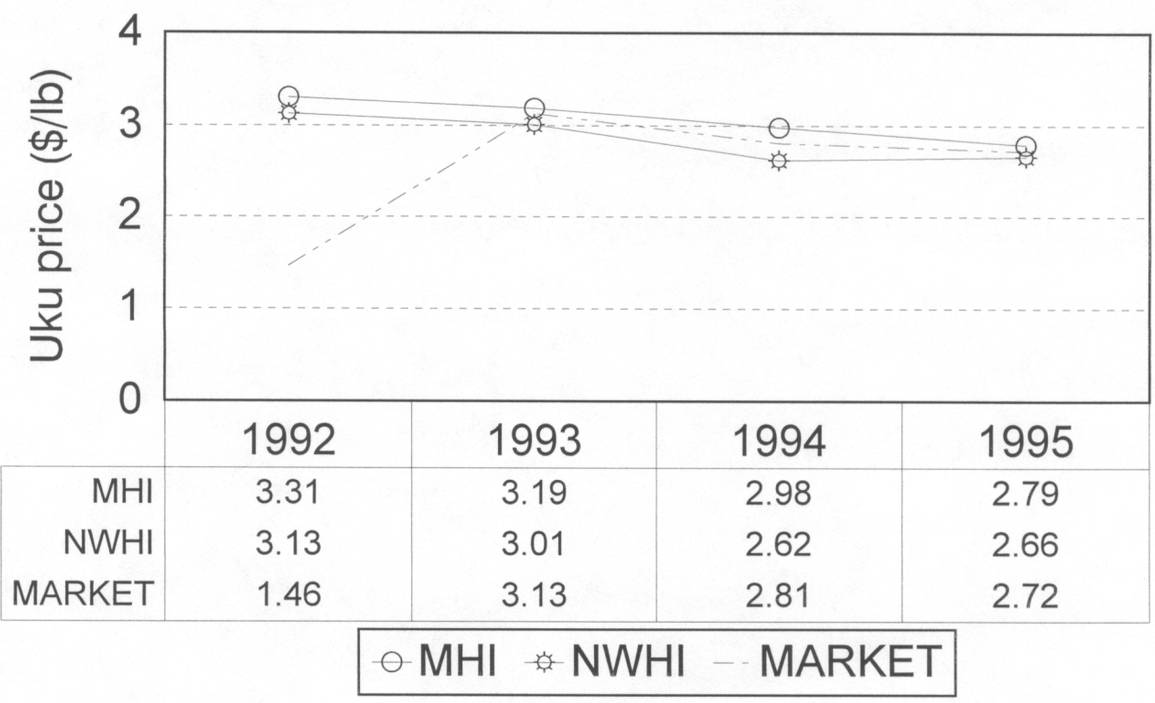


	1992	1993	1994	1995
MHI	3.43	3.25	3.34	3.79
NWHI	2.57	2.78	2.83	3.03
MARKET	2.74	2.86	2.85	3

Figure 9.--Hawaii's market prices for Ehu and Hapuupuu, 1995-95.

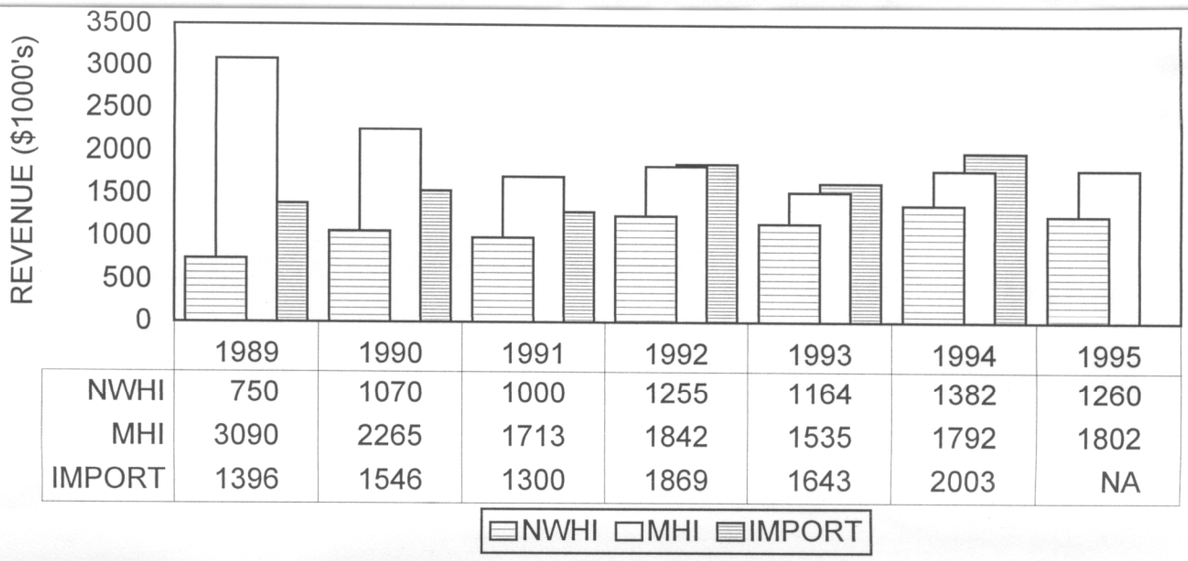


	1992	1993	1994	1995
MHI	3.32	2.75	1.93	2.45
NWHI	1.51	1.67	1.67	1.52
MARKET	1.56	1.74	1.72	1.69



	1992	1993	1994	1995
MHI	3.31	3.19	2.98	2.79
NWHI	3.13	3.01	2.62	2.66
MARKET	1.46	3.13	2.81	2.72

Figure 10.--Hawaii's market prices for Butaguchi and Uku, 1992-95.



	1989	1990	1991	1992	1993	1994	1995
NWHI	750	1070	1000	1255	1164	1382	1260
MHI	3090	2265	1713	1842	1535	1792	1802
IMPORT	1396	1546	1300	1869	1643	2003	NA

Figure 11.--Hawaii's bottomfish market revenue, 1989-95 (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands). Import data for 1995 unavailable.