

COMMERCIAL BOTTOM HANDLINE FISHERY IN THE NORTHWESTERN

HAWAIIAN ISLANDS, 1959-77

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Commercial bottom fishing has been pursued on a small scale in the Northwestern Hawaiian Islands (NWHI) at least since 1945. This report displays and analyzes the bottom fish catch and effort data collected by the Hawaii Division of Fish and Game (HDFG) during the period 1959-77.

The data collected by HDFG consist of catch reports filed by fishermen. The report form requests the fisherman's name, boat number, license number, daily report of the area fished, gear used, weight, number, and the wholesale value of the catch by species. Examination of the catch reports for bottom fishing in the NWHI indicates that fishermen usually did not report catches on a daily basis, but rather, on a boat trip basis. In addition, the number of fish and location fished generally were not precisely reported. Thus, the basic data on the commercial bottom handline fishery in the NWHI consist of the weight and wholesale value by species of fish caught by boat trip. Data collected since 1959 are stored on a computer tape.

THE FISHERY

The basic gear used commercially is the bottom handline. Occasionally, bottom fish will be caught by commercial vessels with a fish trap, but records indicate that trap catches constitute an insignificant portion of the total catch during 1959-77. All subsequent catch data will refer only to catches with bottom handline.

There are essentially 10 species which make up the commercially important bottom fish from the NWHI (Table 1). Of these 10, the bulk of the catch consists of 4 species--ulua, Caranx spp. and Carangoides spp.; hapu'upu'u, Epinephelus quernus; kahala, Seriola dumerili; and opakapaka, Pristipomoides filamentosus.

During the period 1959-77, over 50 metric tons of bottom fish were reported caught in the NWHI on handline gear. One vessel accounted for 95.5% of this catch.

CATCH AND EFFORT

The annual number of boat trips devoted to bottom fishing in the NWHI varied during the period 1959-77 from a high of 20 trips in 1973 and 1977, to a low of 4 trips in 1969. The general trend of effort consists of an average of approximately 14 trips per year during 1959-64, a decline to a minimum of 4 trips in 1969, and an increase to an average of approximately 17 trips per year during 1971-77 (Figure 1 and Table 2).

The trend in total weight caught has paralleled the trend in effort with a dip during the period 1965-69 (Figure 2). There has also been a general decline in total weight caught and a change in the species

composition by trip. A plot of annual catch by species indicates that from 1959 to 1965, an average of approximately 18,000 kg of ulua was caught annually. Since 1965 the catch of ulua has declined and has been replaced by hapu'upu'u as the most abundant species (by weight) in the trip catch (Figure 3 and Table 3).

The reasons for both the "U"-shaped effort curve and the change in composition of annual catch may be due to economic factors rather than biological. An examination of the trend in wholesale prices indicates that prices basically remained constant from 1959 to 1969 (Figure 4 and Table 4). Since fuel and other costs rose during that period, the profitability from bottom fishing in the NWHI decreased. Effort during the period 1965-69 reflected the decreased profitability. Since 1969, wholesale prices increased and as a result, effort increased.

Although the total landings of bottom fish has declined, the total value especially since 1969, has increased (Figure 5 and Table 2).

An examination of effort by month for all fishing trips during 1969-77 does not indicate a strong preference for any season (Table 5).

SUSTAINABLE YIELD

Fishermen reporting bottom fish catches from the NWHI do not precisely report the location fished. The locations reported on the HDFG forms for bottom fish can only be used reliably to establish that the fishing occurred in the NWHI. Since we cannot, therefore, determine catch and effort by bank or region, it is not appropriate to estimate sustainable yield directly with production analysis.

We do, however, have results of production analysis for bottom fish stocks around the main Hawaiian Islands. A range of annual maximum sustainable yield (MSY) for all commercial species of bottom fish per nautical mile of 100-fathom contour has been estimated from 105 kg/nmi for the Oahu bank to 272 kg/nmi for the Maui, Molokai, and Lanai bank (Ralston and Polovina¹). The total length of the 100-fathom contour lines from all the banks in the NWHI is 1,060 nmi. If we assume that abundance and population dynamics in the NWHI are comparable per length of 100-fathom contour to the main Hawaiian Islands, then an estimated range of annual MSY for the entire NWHI for biomass of all commercial species ranges from 111,300 kg based on the Oahu value to 288,320 kg based on the value from the Maui, Molokai, and Lanai bank. Since the total reported bottom fish catch from the NWHI in 1977 was 35,576 kg, this result suggests that the region has potential for much greater exploitation.

¹Ralston, S., and J. Polovina. A multispecies stock production model for Hawaii's handline fishery. Manuscr. in prep. Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Service, NOAA, P. O. Box 3830, Honolulu, Hawaii 96812.

Table 1.--Commercially important species of bottom fish
in the Northwestern Hawaiian Islands.

Scientific name	Commonly used name
Lutjanidae	
<u>Pristipomoides filamentosus</u>	Opakapaka
<u>P. sieboldii</u>	Kalikali
<u>P. zonatus</u>	Gindai
<u>Etelis carbunculus</u>	Onaga
<u>E. marshi</u>	Ehu
<u>Aprion virescens</u>	Uku
Serranidae	
<u>Epinephelus quernus</u>	Hapu'upu'u
Carangidae	
<u>Seriola dumerili</u>	Kahala
<u>Caranx</u> spp. and <u>Carangoides</u> spp.	Ulua
Mullidae	
<u>Mulloidichthys vanicolensis</u>	Weke-ula

Table 2.--Total value and weight of catch and number of trips for bottom handline fishery in the Northwestern Hawaiian Islands.

Year	Dollar value	Kilograms caught	No. of trips
1959	26,896	32,164	10
1960	45,779	49,515	16
1961	30,115	34,476	11
1962	25,363	29,244	13
1963	32,653	40,730	18
1964	39,277	47,260	19
1965	20,118	25,154	9
1966	18,213	21,935	9
1967	13,775	14,822	6
1968	14,320	15,172	6
1969	14,812	18,113	4
1970	39,147	33,683	11
1971	50,206	34,180	17
1972	41,992	19,356	17
1973	62,759	28,050	20
1974	48,899	22,313	15
1975	63,873	27,012	14
1976	78,476	26,730	14
1977	95,659	35,576	20

Table 3.--Total catch of handline for selected bottom fishes in the Northwestern Hawaiian Islands in kilograms.

Year	Opakapaka	Kahala	Hapu'upu'u	Ulua	Kalikali	Onaga	Ehu	Uku	Gindai	Weke-ula
1959	11,796	4,677	7,500	7,865	110	--	95	60	36	--
1960	12,828	3,013	6,340	23,055	166	3,497	461	22	131	--
1961	10,255	6,311	1,340	16,092	32	128	205	50	46	17
1962	8,645	2,203	4,715	12,950	155	105	316	5	102	3
1963	5,320	5,444	9,024	18,305	186	315	1,265	685	125	61
1964	5,336	4,456	6,715	25,054	100	4,444	1,088	17	50	--
1965	1,002	2,464	4,959	14,872	15	386	1,023	431	2	--
1966	2,130	3,089	9,010	7,413	8	46	111	122	3	3
1967	1,452	994	6,474	5,620	18	1	200	40	22	--
1968	413	1,378	4,476	8,335	12	11	410	84	53	--
1969	395	614	1,321	15,681	9	--	54	18	20	--
1970	1,444	5,821	12,192	11,016	347	135	1,511	833	376	7
1971	2,745	2,356	15,829	10,165	185	320	1,927	134	515	4
1972	349	2,200	8,146	1,102	403	492	4,494	1,886	274	10
1973	585	3,642	16,780	994	632	1,300	2,596	1,060	456	5
1974	1,688	1,073	9,348	4,052	432	747	2,631	2,138	183	22
1975	6,274	1,730	9,849	7,920	175	80	828	104	35	19
1976	4,695	2,112	13,716	4,255	22	493	875	554	--	8
1977	9,812	5,630	10,262	7,360	38	16	564	1,820	52	20

Table 4.--Wholesale price per kilogram for some bottom fishes.

Year	Opakapaka	Kalikalif	Onaga	Uku	Gindai	Hapu'upu'u	Kahala	Ulua
1959	\$0.92	\$0.86	--	\$0.99	\$0.68	\$0.97	\$0.44	\$0.79
1960	1.08	0.95	\$1.41	0.99	0.90	1.06	0.48	0.79
1961	0.90	0.97	1.32	0.99	0.68	1.14	0.53	0.77
1962	0.97	0.79	1.25	0.73	0.64	0.92	0.57	0.81
1963	1.06	0.81	1.61	0.92	0.79	0.84	0.53	0.73
1964	1.08	0.90	1.39	0.95	0.79	0.84	0.51	0.73
1965	1.21	0.84	1.50	1.14	1.10	0.95	0.51	0.70
1966	1.12	1.01	2.11	1.03	0.88	0.99	0.51	0.66
1967	1.34	0.68	3.30	1.19	0.66	1.01	0.64	0.77
1968	1.50	2.55	3.12	2.44	1.36	1.30	0.59	0.73
1969	1.94	2.07	--	1.32	1.85	1.50	0.42	0.75
1970	2.29	2.55	2.75	1.47	1.72	1.36	0.59	0.79
1971	1.98	2.38	3.32	1.74	1.65	1.63	0.81	0.92
1972	3.39	2.44	3.72	1.69	2.02	2.09	1.06	1.74
1973	2.16	2.31	3.52	1.98	2.07	2.27	1.28	1.74
1974	2.44	2.73	4.47	2.29	2.07	2.22	0.86	1.30
1975	3.34	2.22	2.95	1.85	2.16	2.44	1.14	1.69
1976	3.78	3.39	3.89	3.50	--	2.93	1.39	2.53
1977	3.78	1.78	5.65	3.72	2.84	2.86	1.36	2.40

Table 5.--Total boat trips per month in the
Northwestern Hawaiian Islands, 1959-77.

Month	No. of trips
January	10
February	17
March	17
April	22
May	26
June	20
July	22
August	19
September	30
October	21
November	21
December	24

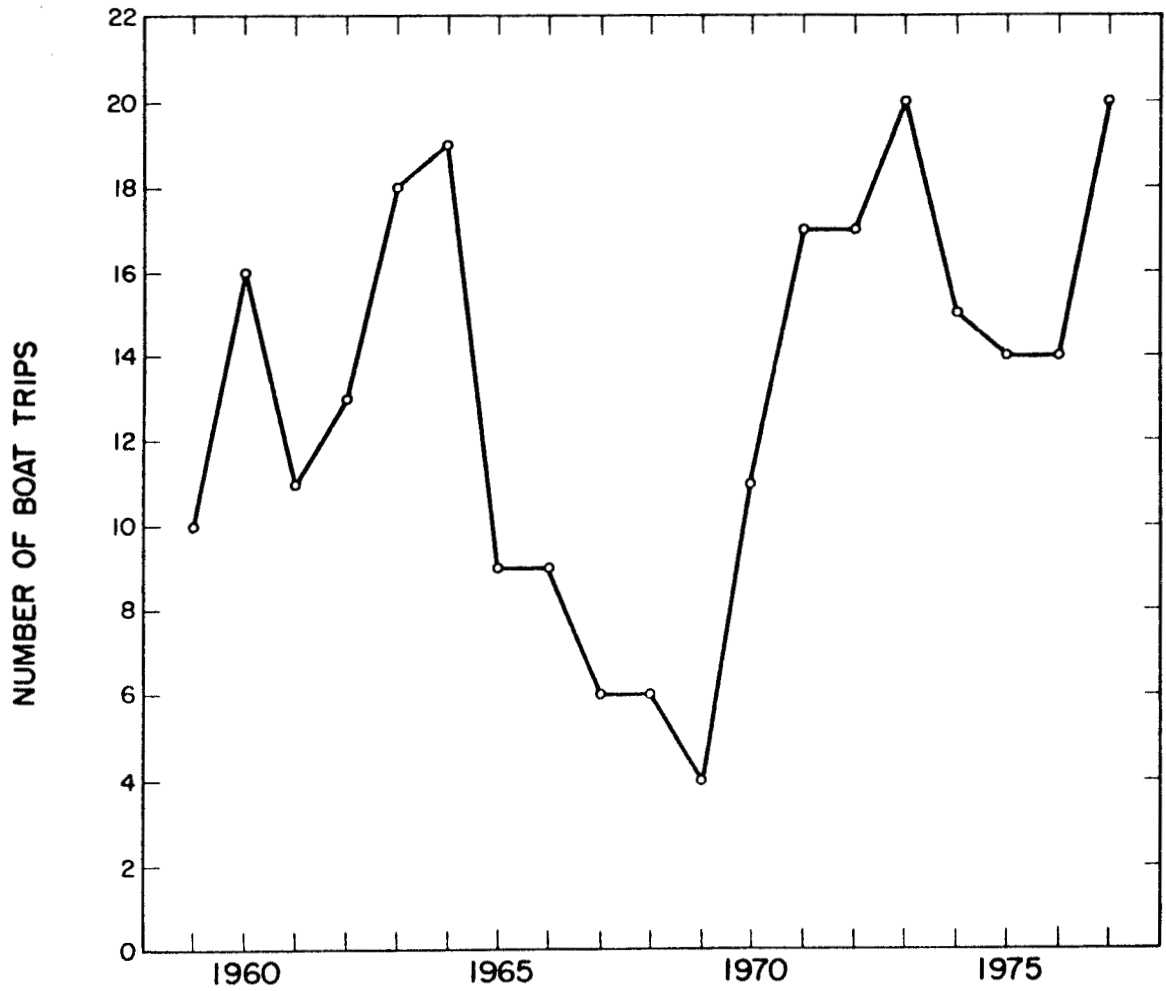


Figure 1.--Total effort in boat trips to the Northwestern Hawaiian Islands for bottom handline fishery.

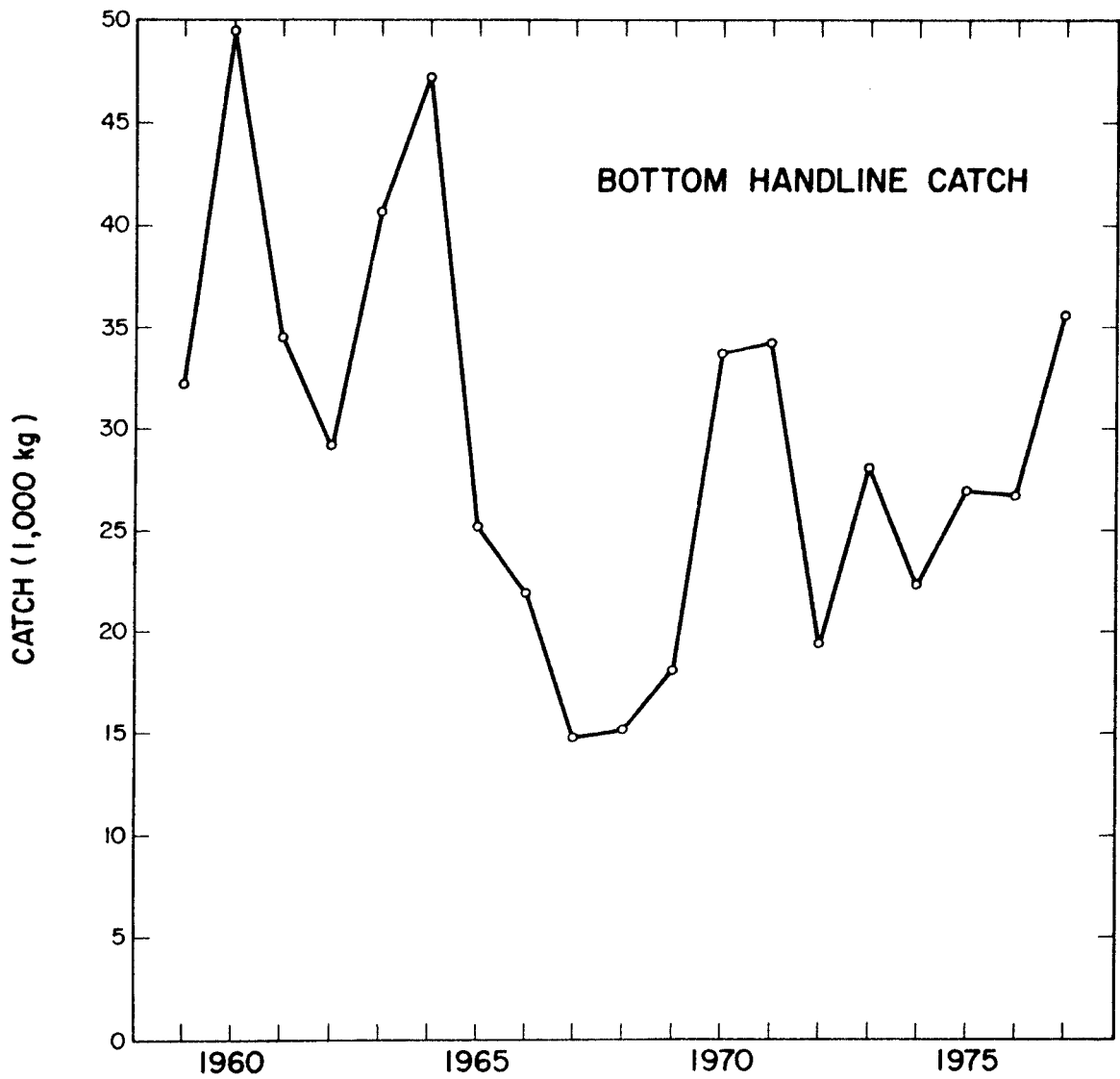


Figure 2.--Total bottom handline catch in kilograms from the Northwestern Hawaiian Islands.

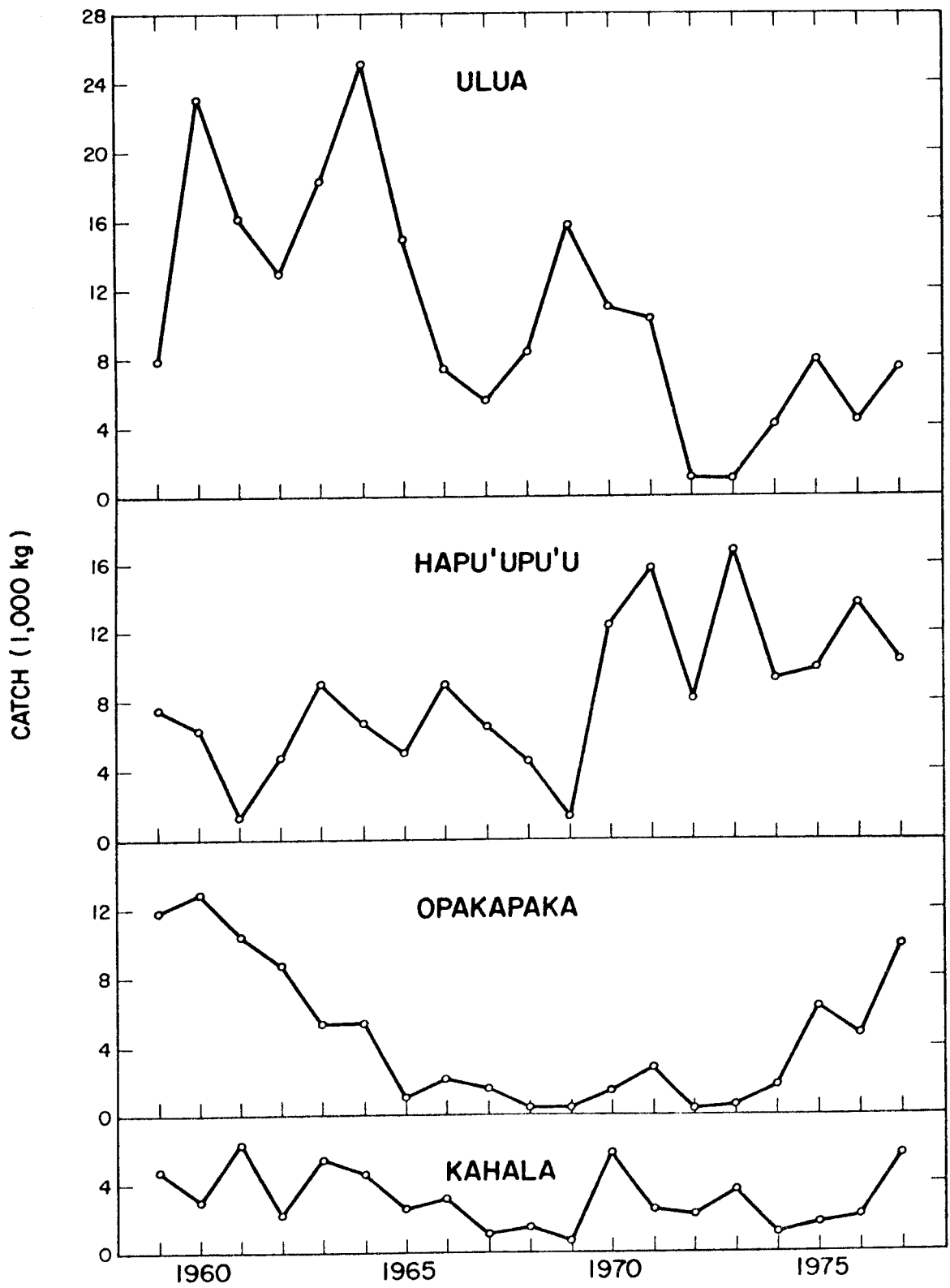


Figure 3.--Annual catches of ulua, kahala, hapu'upu'u, and opakapaka with bottom handline from the Northwestern Hawaiian Islands.

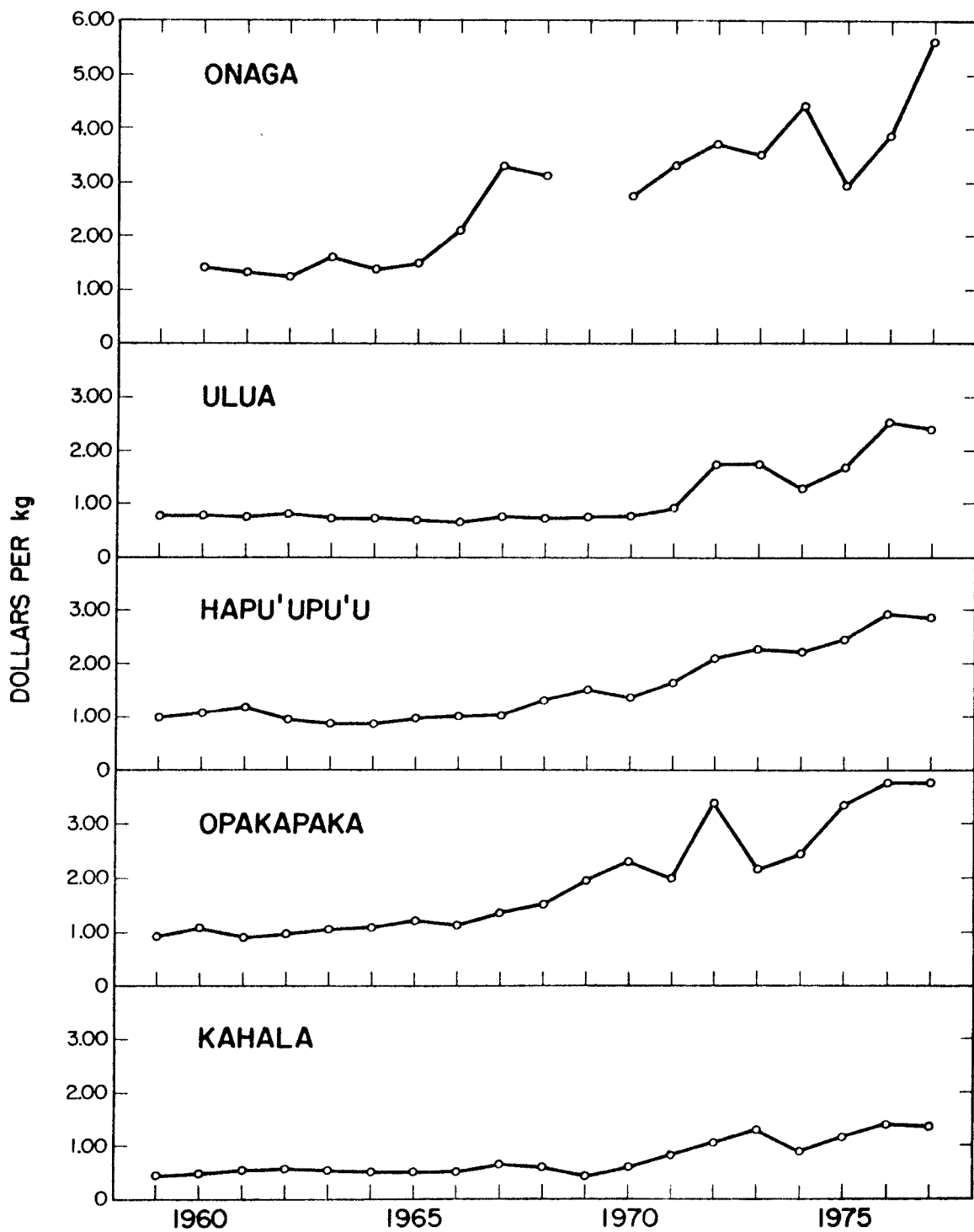


Figure 4.--Wholesale price per kilogram for species of bottom fish from the Northwestern Hawaiian Islands.

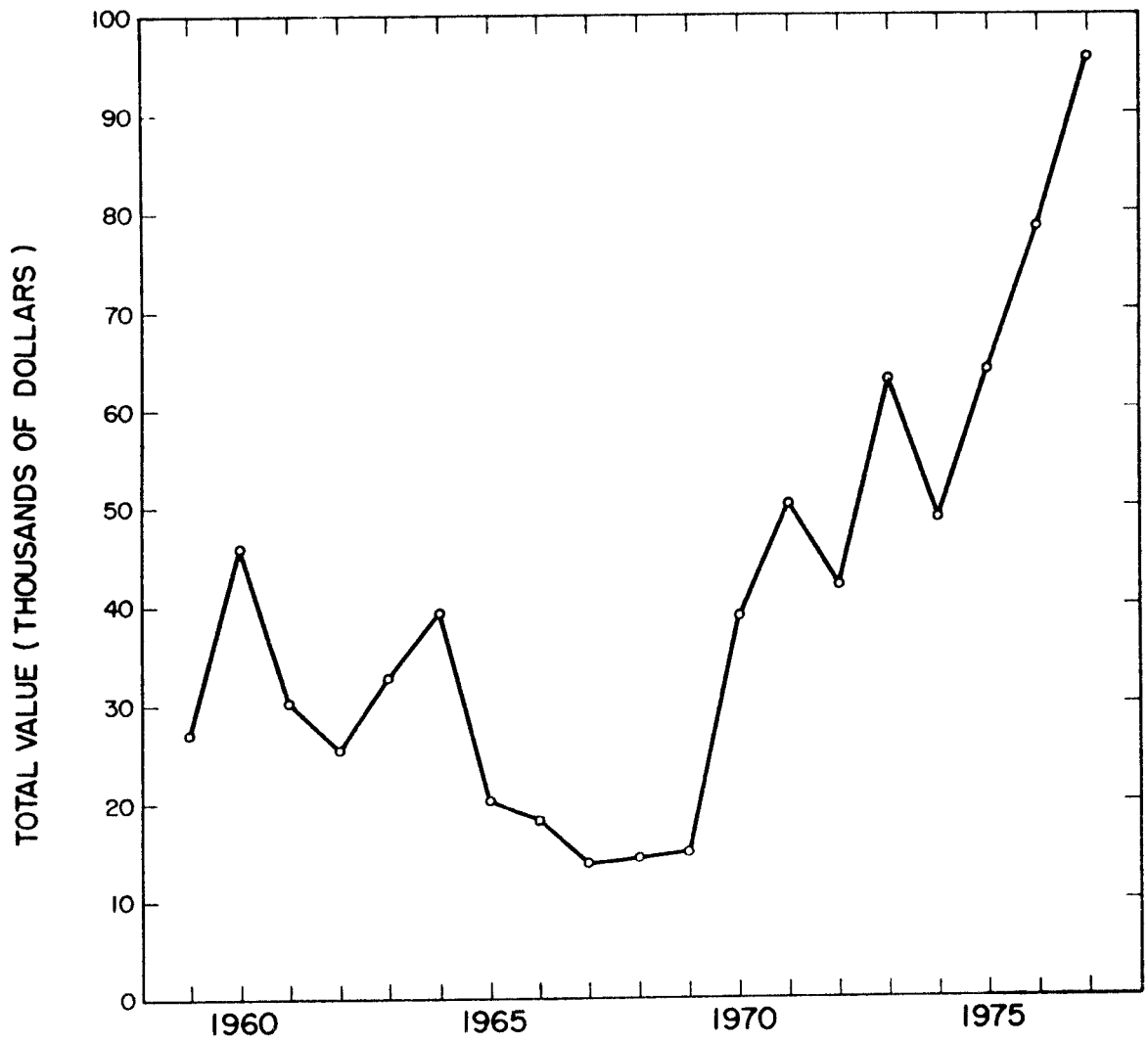


Figure 5.--Value of all bottom handline catches from the Northwestern Hawaiian Islands.