Southwest Fisheries Center Administrative Report No. 8H, 1978

RECENT TRENDS IN CATCH, FISHING EFFORT, AND CATCH PER UNIT EFFORT FOR THE SOUTH PACIFIC ALBACORE FISHERY BASED IN AMERICAN SAMOA, 1954-76.

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February 1978

INTRODUCTION

While there was some exploratory longline fishing by the Japanese in 1952 and 1953, the South Pacific tuna longline fishery became firmly established in January 1954 when a cannery in Pago Pago, American Samoa contracted with seven Japanese tuna longline vessels to supply it with tuna. A second cannery was opened in 1963. In 1954 and 1955, the landings of yellowfin tuna, Thunnus albacares (Bonnaterre), exceeded that for albacore, T. alalunga (Bonnaterre), but the fishery soon developed into an albacore fishery with other tuna species being of minor importance. Other bases have been established at Espíritu Santo, New Hebrides (1958); Levuka, Fiji Islands (1963); and Tahiti (1971). Home-based tuna vessels from Japan and to a lesser extent from Korea and the Republic of China (Taiwan), also participate in the fishery.

Catch Trends

As mentioned earlier, the catch of yellowfin tuna exceeded that of albacore in 1954 and 1955. From 1955 through about 1964, the catch of albacore increased fivefold while that for yellowfin tuna remained stable (Table 1, Figure 1). The catch of albacore continued to increase through 1973 when a catch of 30,148 metric tons (MT) was made. Following 1973, the catch declined drastically in response to declining catch rate and a decreasing fleet size. The catch of bigeye tuna, T. obesus (Lowe), has generally been much less than for either albacore or yellowfin tuna, but in the last few years the bigeye tuna catch has remained relatively stable while that for the other tuna species has declined. Billfish catch has never been significant, and it too has declined in recent years.

When the catch is presented according to the national origin of the longline vessels (Table 2), it can be seen that each of the fleets has concentrated its fishing effort on albacore. The only exceptions are in 1954-55 by Japanese vessels and in 1975 by Korean vessels.

Fishing Units

Longline vessels from Japan began fishing from Pago Pago, American Samoa in January 1954, had the fishery to themselves until 1959, and withdrew from the fishery after 1972 (Figure 2). Vessels from Korea joined the fishery in 1959, and vessels from Taiwan did so in 1964. The number of vessels reached a high of 309 (156 Korean and 153 Taiwanaese) in 1973, and then declined drastically to 133 by 1976.

The mean size of the longline tuna vessels remained at approximately 100 gross tons through the first decade of the fishery (Figure 3). Larger vessels began entering the fishery toward the end of the first decade, and smaller vessels too, but the resultant mean size increased to 175 gross tons by 1975. The largest vessel to participate in the fishery has been a 680-gross ton Korean vessel, while the smallest has been a 23-gross ton Taiwanese vessel.

The number of fishing trips (Figure 4) made by the longline vessels based in American Samoa has followed a trend similar to that for the number

of vessels. The increase in the number of trips through 1963 was due to Japanese vessels while the continued increase and subsequent decrease were due to Korean and Taiwanese vessels. The greatest number of trips was 872 in 1973. By 1976, there were only 265 trips, which is comparable to the number made in 1956 and 1961.

Fishing Effort

Two measures of fishing effort collected are the number of days fished and the number of hooks fished. Since the number of hooks fished is collected from a variable portion of the fleet, it gives a biased picture of the total fishing effort expended by the fleet and will not be presented here. However, the number of hooks fished will be used in calculating an index of relative abundance.

The number of days fished increased slowly through the first decade of the fishery, but then rose rapidly to a high of 47,549 days fished in 1973 (Figure 5). That is a fivefold increase in 9 years. Subsequently, the amount of fishing effort has declined sharply and reached 16,111 days in 1976, which is comparable to the amount of fishing effort expended over a decade ago.

Indexes of Relative Abundance

Estimates of relative abundance have been calculated in terms of metric tons per day fished and number caught per 100 hooks fished for albacore, yellowfin tuna, and bigeye tuna (Table 3). Also metric tons per trip has been included for comparison with valid measures of relative abundance. The diagram of metric tons per day fished shows a continuous decline in the relative abundance of the albacore stock from 1957 through 1975 (Figure 6). The decline is an impressive 76.0% reduction in the relative abundance of the albacore stock in 20 years of fishing. The number caught per 100 hooks fished shows essentially the same decline in relative abundance. The increase in relative abundance in 1976 may be in response to the reduced amount of fishing effort for the last few years or it may represent an increase in recruitment. In monthly plots of the number caught per 100 hooks fished (not presented here), the index of relative abundance during the peak of the southern winter, which is when the youngest albacore are caught in the southern extremes of the fishery, shows a steady decline from 1970 to 1974. In 1975, the southern winter fishery on small albacore failed to materialize. In 1976, the fishery materialized but the number caught per 100 hooks fished was the smallest on record except for 1975.

A generalized production model assessment of the status of the South Pacific albacore fishery by Skillman (1975) indicated that optimum catch per unit effort in order to maintain maximum sustainable yield was about 0.79 metric ton per day fished. This level of relative abundance was passed by the fishery in about 1970. The precipitous decline in relative abundance indicates that the albacore stock has been overfished and should be allowed to rebuild. The decline in the index of relative abundance during the southern winter fishery for small albacore may indicate that

the adult stock has been reduced to such an extent that recruitment has been impaired.

The indexes of relative abundance for yellowfin tuna and bigeye tuna do not indicate any long-term trends.

LITERATURE CITED

SKILLMAN, R. A.
1975. An assessment of the South Pacific albacore, Thunnus alalunga, fishery, 1953-72. Mar. Fish. Rev. 37(3):9-17.

Table 1.--Total catch (metric tons) by species and by year of capture, 1954-76, for the American Samoa fishery.

Year	Albacore	Yellowfin tuna	Bigeye tuna	Billfishes
1954	349	607	27	--
1955	2,110	2,260	24	--
1956	3,706	2,107	216	--
1957	6,029	1,599	315	--
1958	9,935	2,486	473	69
1959	10,292	1,776	447	110
1960	11,191	1,132	246	75
1961	9,740	1,328	158	75
1962	13,326	1,403	557	77
1963	14,650	2,145	1,609	168
1964	10,791	2,464	1,595	160
1965	15,459	4,476	2,933	417
1966	25,570	6,545	4,537	559
1967	28,310	5,326	5,540	405
1968	17,723	7,337	2,769	649
1969	18,731	8,139	3,221	1,153
1970	23,876	7,697	2,975	1,017
1971	22,193	8,567	2,058	1,988
1972	20,168	12,777	3,140	4,651
1973	30,148	10,480	4,496	3,925
1974	14,641	7,278	3,405	2,671
1975	7,840	6,142	4,349	1,204
1976	9,855	5,026	2,710	602

Table 2.--Catch (metric tons) of albacore and yellowfin tuna by nationality of vessel and by year of capture for the fishery based in American Samoa, 1954-76.

Year	Albacore			Yellowfin tuna		
	Japan	Korea	Taiwan	Japan	Korea	Taiwan
1954	349	--	--	603	--	--
1955	2,110	--	--	2,260	--	--
1956	3,706	--	--	2,107	--	--
1957	6,004	--	--	1,577	--	--
1958	9,784	146	--	2,412	70	--
1959	9,834	456	--	1,706	67	--
1960	10,581	610	--	1,047	84	--
1961	9,225	330	--	1,231	46	--
1962	12,605	635	--	1,349	47	--
1963	12,682	1,461	--	1,879	261	--
1964	8,097	1,850	556	1,943	411	111
1965	9,518	4,350	1,590	2,404	1,426	646
1966	9,086	9,123	7,361	2,429	2,012	2,104
1967	7,528	9,636	11,147	1,144	2,013	2,169
1968	3,156	6,349	8,218	1,052	2,979	3,305
1969	1,560	10,184	6,987	641	4,914	2,584
1970	952	11,942	10,982	226	3,664	3,808
1971	380	11,780	10,140	75	3,731	4,761
1972	60	9,863	10,244	55	6,648	6,074
1973	--	16,767	13,381	--	6,748	3,732
1974	--	6,844	7,798	--	5,195	2,083
1975	--	3,443	4,397	--	4,593	1,549
1976	--	5,475	4,380	--	4,059	967

Table 3.--Indexes of relative abundance for albacore, yellowfin tuna, and bigeye tuna for the longline fishery based in American Samoa, 1954-76.

Year	Albacore			Yellowfin tuna			Bigeye tuna		
	MT/trip	MT/day fished	Number/100 hooks[1]	MT/trip	MT/day fished	Number/100 hooks[1]	MT/trip	MT/day fished	Number/100 hooks[1]
1954	5.5	--	--	9.5	--	--	0.4	--	--
1955	14.9	--	--	15.9	--	--	0.2	--	--
1956	14.1	--	--	8.0	--	--	0.8	--	--
1957	17.1	2.5	--	4.5	0.7	--	0.9	0.1	--
1958	22.3	1.8	--	5.6	0.5	--	1.1	0.1	--
1959	28.7	2.0	--	4.9	0.3	--	1.2	0.1	--
1960	39.3	1.7	--	4.0	0.2	--	0.9	0.0	--
1961	35.3	1.8	--	4.8	0.2	--	0.6	0.0	--
1962	36.0	1.6	8.44	3.8	0.2	0.32	1.5	0.1	0.23
1963	29.8	1.2	5.23	4.4	0.2	0.49	3.3	0.1	0.58
1964	28.5	1.2	4.96	6.5	0.3	0.71	4.2	0.2	0.51
1965	32.2	1.0	4.57	9.3	0.3	0.81	6.1	0.2	0.58
1966	35.1	1.1	5.20	9.0	0.3	0.65	6.2	0.2	0.50
1967	35.5	1.0	4.48	6.7	0.2	0.45	6.9	0.2	0.46
1968	30.5	0.7	3.43	12.6	0.3	1.01	4.8	0.1	0.47
1969	34.1	0.8	3.64	14.8	0.3	0.81	5.9	0.1	0.45
1970	37.2	0.9	3.98	12.0	0.3	0.68	4.6	0.1	0.30
1971	35.6	0.7	3.33	13.7	0.3	0.81	3.3	0.1	0.32
1972	31.8	0.6	2.87	20.1	0.4	0.92	4.9	0.1	0.34
1973	34.6	0.6	3.04	12.0	0.2	0.43	5.2	0.1	0.26
1974	21.9	0.4	1.82	10.9	0.2	0.50	5.1	0.1	0.24
1975	19.9	0.3	1.12	15.6	0.3	0.70	11.0	0.2	0.60
1976	37.2	0.6	1.89	19.0	0.3	0.47	10.2	0.2	0.37

[1]Ratio of averages.

Figure 1. Total catch by species by year of capture for the fishery in American Samoa, 1954-76.

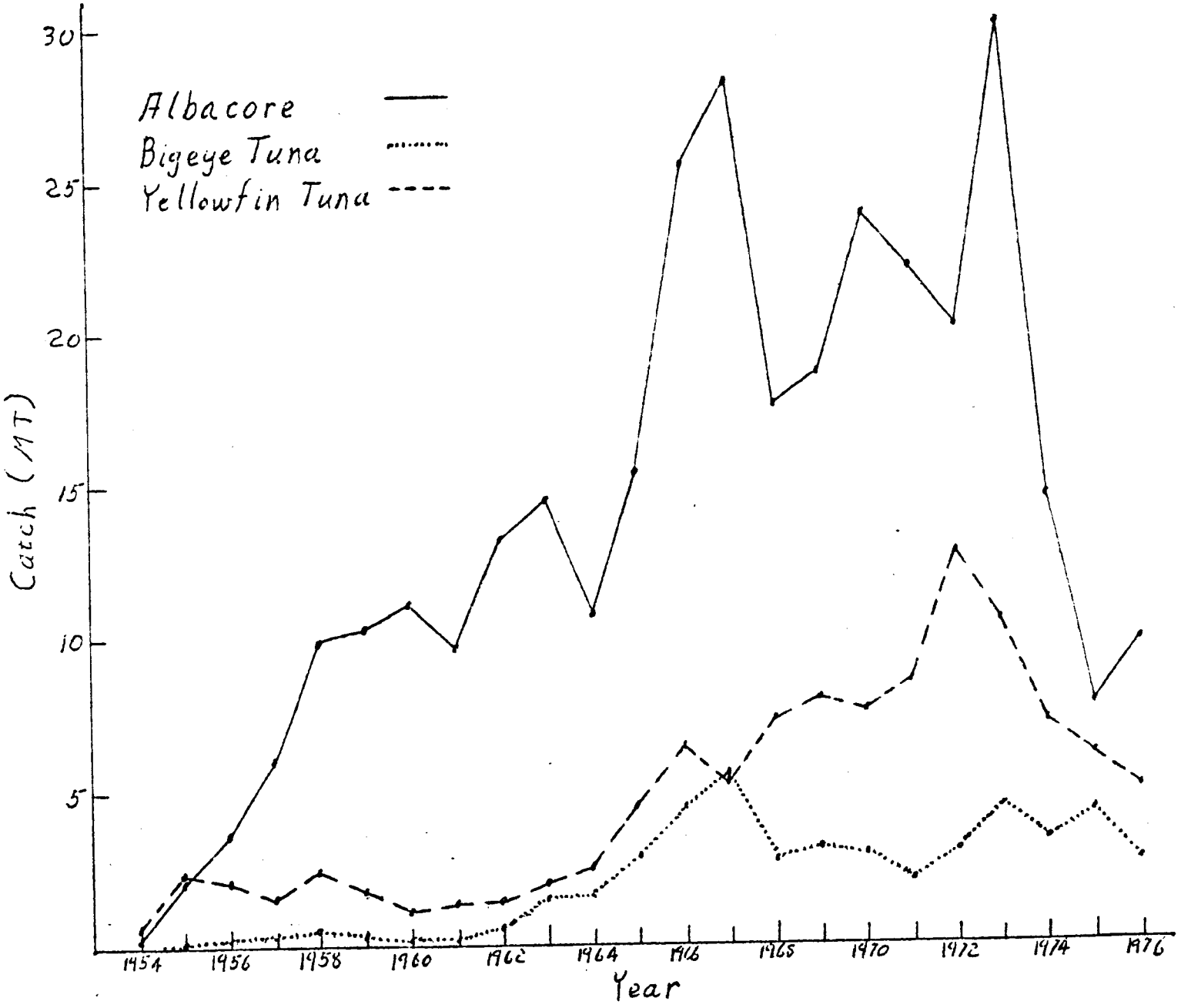


Figure 2. Number of longline vessels based in American Samoa, by nationality, 1954-76.

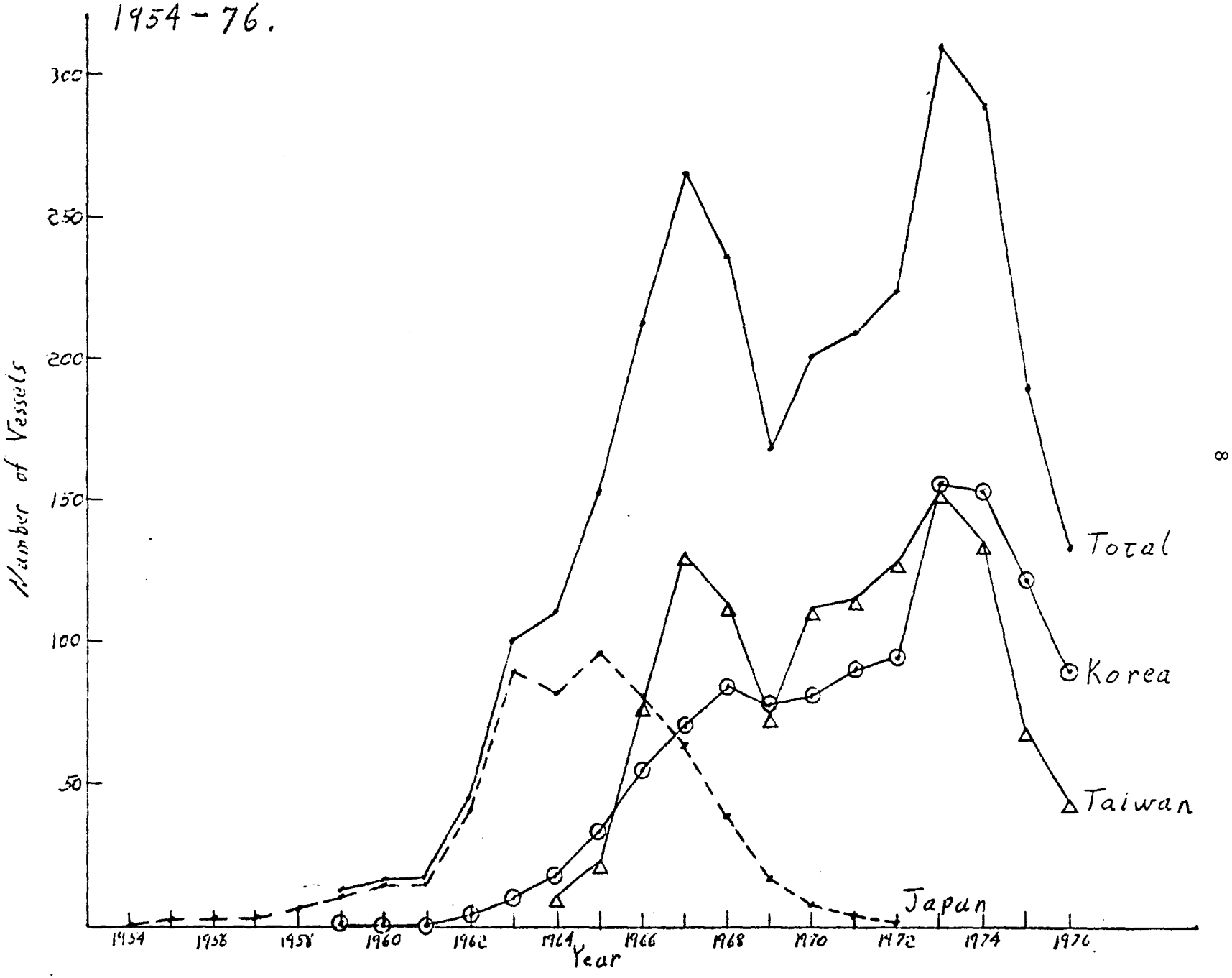


Figure 3. Maximum, mean, and minimum gross tonnage of the longline vessels based in American Samoa, 1954-76.

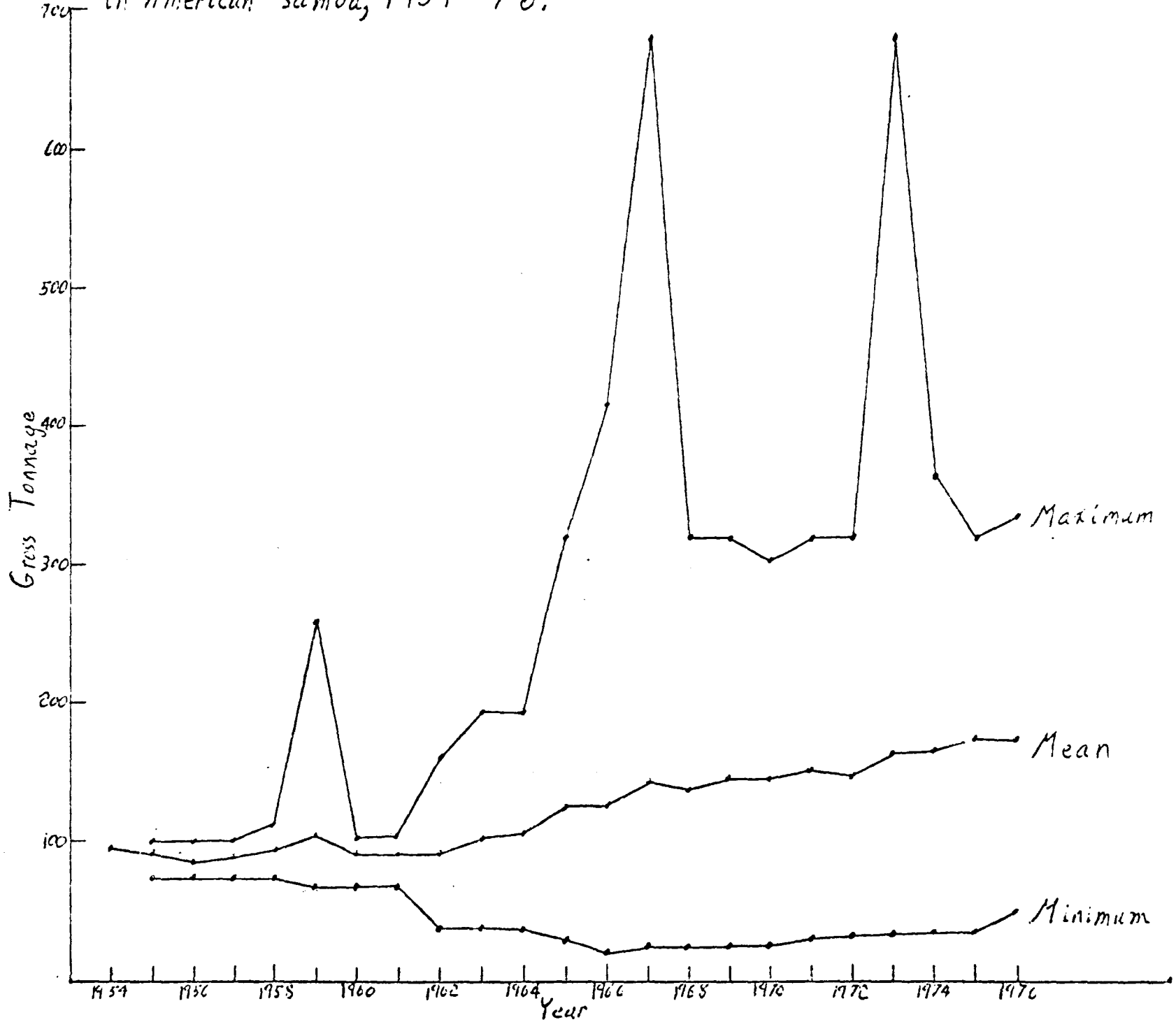
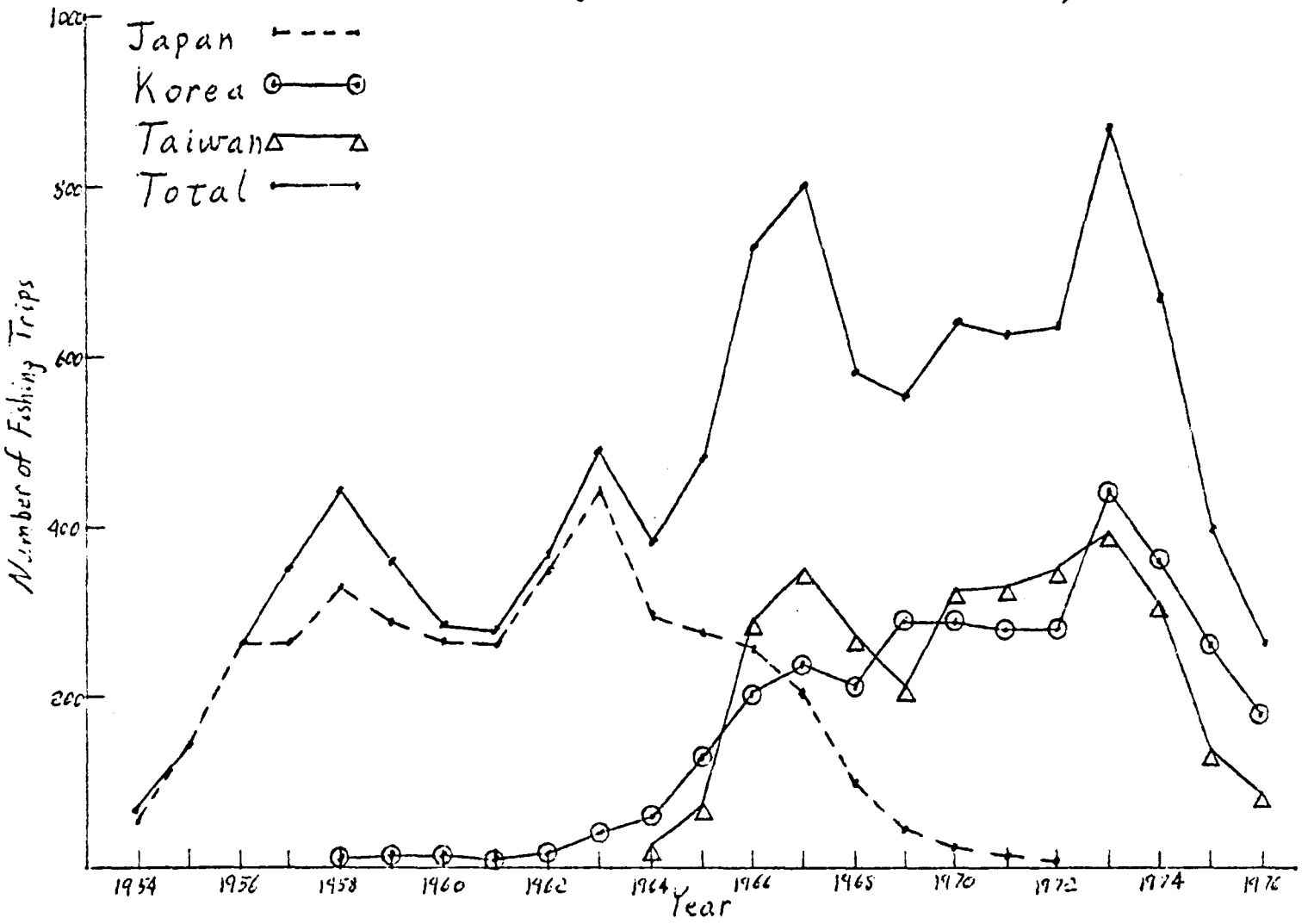


Figure 4. Number of fishing trips by nationality of vessels and by all vessels for the fishery based in American Samoa, 1954-76.



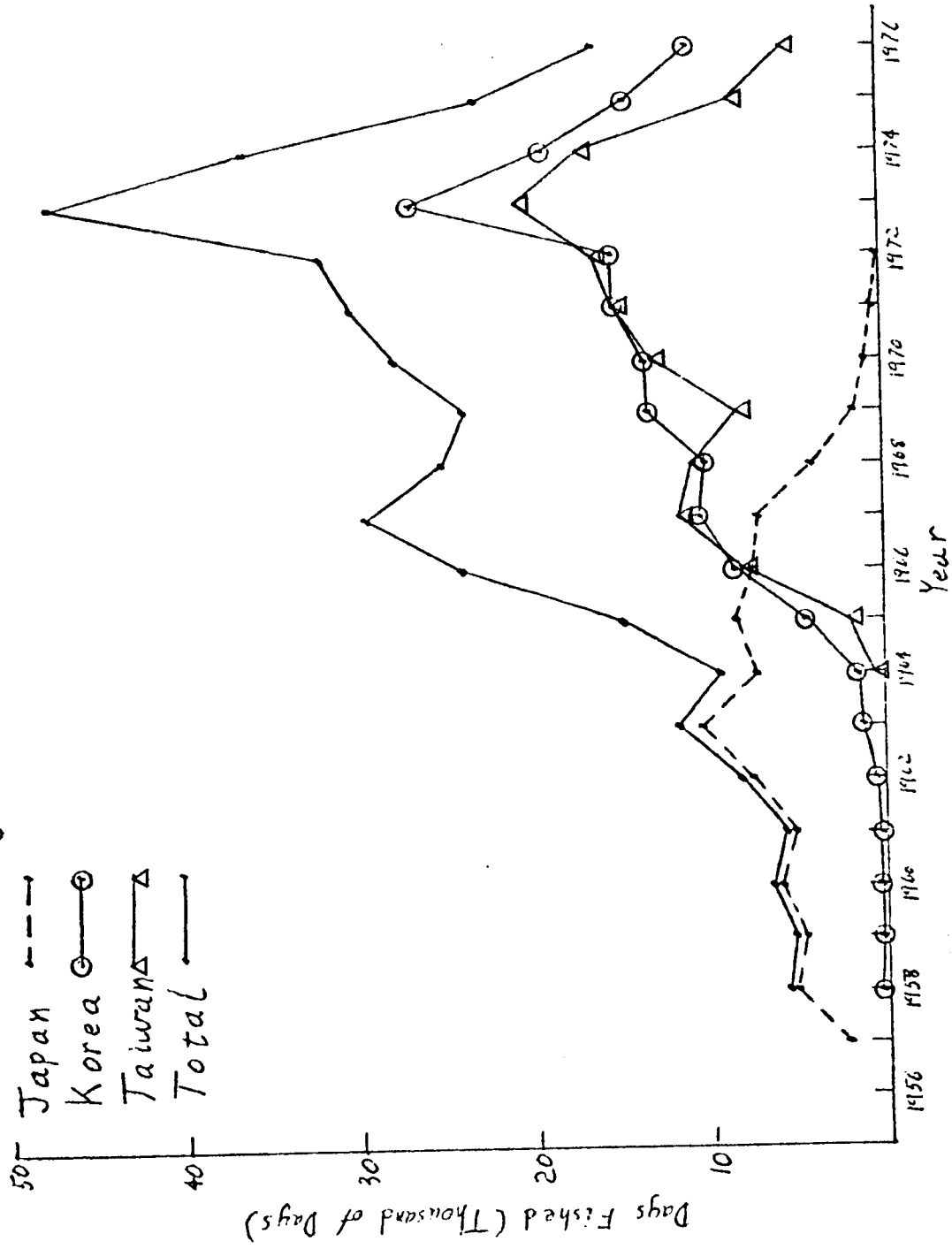


Figure 5. Number of days fished by nationality of vessels and by all vessels for the fishery based in American Samoa, 1957-76.

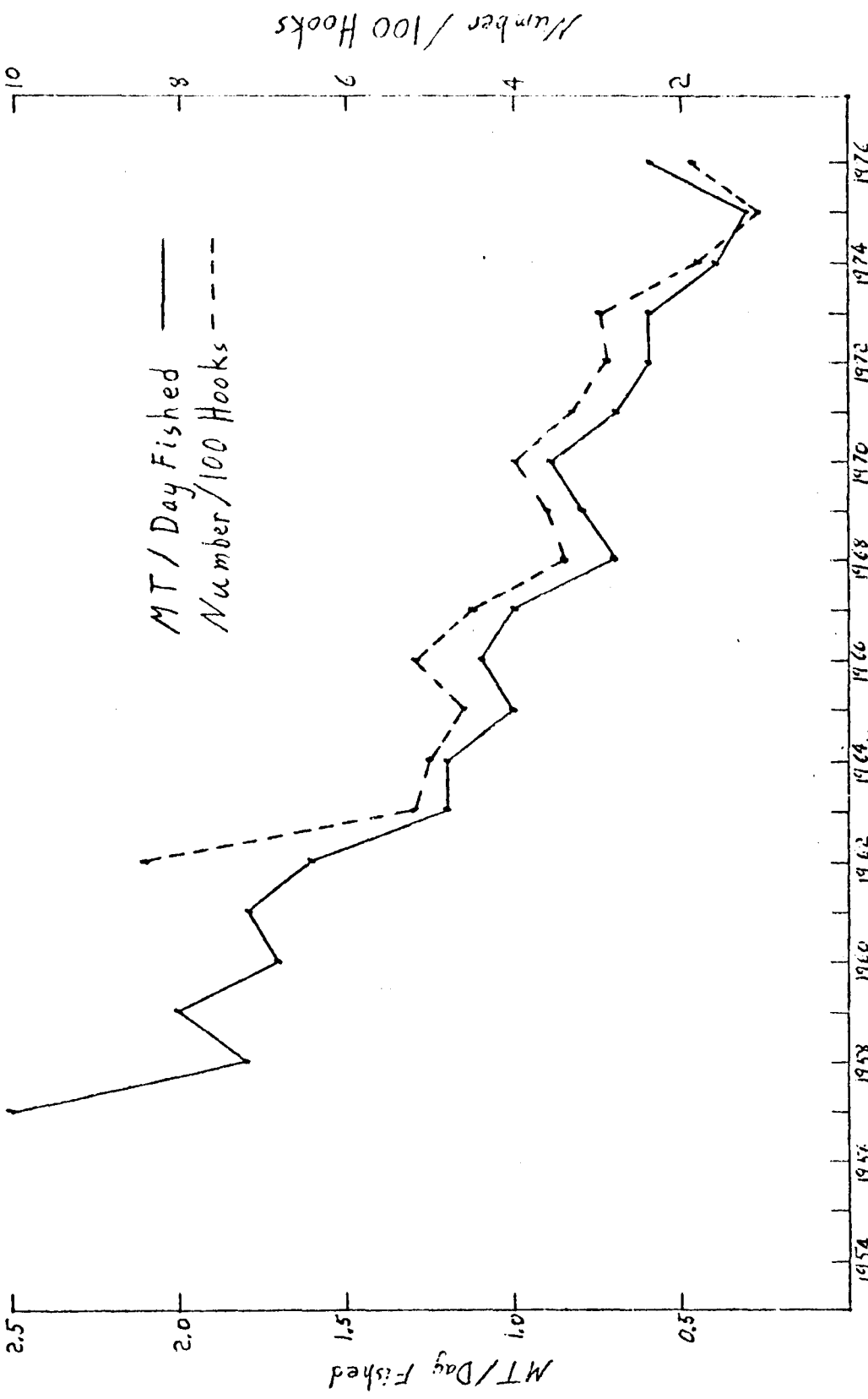


Figure 6. Indexes of relative abundance for the longline fishery based in American Samoa, for albacore.