U.S. Tuna Trade Summary, 1985

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Introduction

For the U.S. tuna industry, 1985 appeared to be a year of relative calm following 3 years of turmoil that saw the closure of four canneries in California and Hawaii, as well as a significant reduction in U.S. tuna harvesting capacity. Although not as tumultuous, 1985 was a continuation of recent trends characterized by further attrition of the U.S. tuna fleet, decreased cannery deliveries of domestically caught tuna, a decline in U.S. cannery production, and increased imports of canned tuna.

The development of significant new tuna fisheries in the Indian Ocean and the western Pacific Ocean and improved catch rates in traditional fishing areas in recent years are factors which have led to greatly increased supplies of raw tuna available through the international market. As a result, ex-vessel prices have fallen sharply to levels below what it costs to harvest tuna for many of the vessels in the U.S. fleet. The opportunity to reduce production costs by purchasing tuna through the international market, particularly at a time when revenues were being severely squeezed by intense competition from canned imports, moved U.S. processors to revise their raw tuna procurement strategies.

Historically, processors relied on close integration with the U.S. fleet to secure dependable supplies of low-cost tuna which were then supplemented through imports to meet processing requirements. With reliable supplies of tuna available from numerous sources outside the United States, however, long-term supply arrangements with the U.S. fleet are no longer as critical and processors have lessened their reliance on U.S. vessels. Confronted by reduced cannery support and by ex-vessel prices below the vessel's breakeven production level, many vessels were compelled to leave the fleet. By the close of 1985, the U.S. tropical tuna fleet had experienced a 15 percent loss in number and a 12 precent reduction in carrying capacity and, for the first time in recent history, no new vessels entered the fishery.

With the reduction in domestic processing capacity that occurred during 1984, U.S. cannery receipts[1] of imported and domestically caught albacore, *Thunnus alalunga* (white meat) and tropical (light meat) tunas (skipjack tuna, *Euthynnus pelamis*; yellowfin tuna, *T. albacares*; blackfin tuna, *T. atlanticus*; bluefin tuna, *T. thynnus*; and bigeye tuna, *T. obesus*) fell sharply in 1985. The total volume was 468,956 short tons (tons), a decrease of 11 percent in total volume from 1984 and 15 percent below the 1980-84 average volume of annual cannery receipts (Table 1). Cannery deliveries by domestic vessels amounted to 213,808 tons in 1985, 16 percent below deliveries for 1984 and 14 percent below the 5-year average from 1980 to 1984 (Table 1). Raw tuna imports made up the 255,145-ton balance in total cannery supplies for 1985, a 5 percent decrease in imports from 1984 and 16 percent below the 1980-84 annual average for imports. Direct exports[2] of domestically caught tuna totaled 34,797 tons in 1985, up 7 percent from 1984 and 324 percent greater than the 5-year average. When exports of domestically caught tuna are combined with domestic deliveries to U.S. canneries, total U.S. deliveries amounted to 248,605 tons for 1985, 13 percent less than the corresponding amount for 1984 and 4 percent less than the 5-year average.

The western Pacific Ocean[3] was the predominant production area for the U.S. fleet in 1985, providing 129,431 tons or 52 percent of the domestically caught cannery receipts and direct exports for the year (Table 2). Total domestically caught deliveries from this area decreased 31 percent from 1984, however, and as a share of total domestically caught deliveries by oceanic area, western Pacific deliveries decreased 21 percent from 1984. The western Pacific was also the area from which most of the raw tuna imports originated in 1985—74,356 tons, or 29 percent of total imports by oceanic area (Table 3).

The decrease in western Pacific fishing activity by the U.S. fleet during 1985 can be largely attributed to prevailing economic conditions and increased yields of yellowfin tuna in the eastern Pacific Ocean following the El Niño conditions of 1982-83. The lowest ex-vessel prices in 5 years, particularly for skipjack tuna, and exceptionally good fishing for yel-

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[1]Cannery receipts include only tuna destined for U.S. canneries. Cannery receipts exclude U.S.-caught tuna landed at foreign sites, U.S.-caught tuna landed at U.S. sites that is destined for foreign canneries, U.S.-caught tuna destined for the fresh-fish market, tuna imported as flakes, imported tuna not fit for human consumption, and imported "sushi" grade tuna.

[2]In this report, exports include tuna landed directly in or transshipped to a foreign country; excludes tuna exported from the U.S. east coast.

[3]The eastern and western Pacific for this report are distinguished at long. 150°W.

Table 1.—U.S. tuna cannery receipts (short tons) by processing site and direct exports, 1980-85.

Species	California/American Samoa/Hawaii							Puerto Rico						
	1980	1981	1982	1983	1984	1985	80-84 Avg.	1980	1981	1982	1983	1984	1985	80-84 Avg.
Domestic														
Albacore	8,078	14,855	6,965	10,466	10,323	5,608	10,137	20	2		4	3,565	1,245	718
Skipjack tuna	99,386	83,880	82,669	113,465	94,152	66,716	94,711	15,781	13,950	18,781	41,608	51,441	17,304	28,312
Yellowfin tuna[1]	100,523	100,117	93,468	90,052	59,907	35,365	88,813	18,693	26,049	24,800	30,044	35,193	87,571	26,956
Subtotal	207,987	198,852	183,102	213,983	164,382	107,689	193,661	34,494	40,001	43,581	71,656	90,199	106,120	55,986
Imported[2]														
Albacore	37,664	43,241	33,928	22,750	21,962	20,030	31,909	46,147	44,056	60,670	50,105	70,882	75,122	54,372
Skipjack tuna	103,556	72,189	45,837	50,633	28,737	18,026	60,190	105,075	115,820	82,178	84,675	106,136	74,606	98,777
Yellowfin tuna[1]	36,091	39,293	17,811	14,081	12,685	10,169	23,993	38,382	44,295	33,402	24,251	29,045	57,192	33,874
Subtotal	177,311	154,723	97,576	87,464	63,384	48,225	116,092	189,604	204,171	176,250	159,031	206,063	206,920	187,023
Grand total	385,298	353,575	280,678	301,447	227,766	155,914	309,753	224,098	244,172	219,831	230,687	296,262	313,040	243,009

Species	Direct exports[3]							Total						
	1980	1981	1982	1983	1984	1985	80-84 Avg.	1980	1981	1982	1983	1984	1985	80-84 Avg.
Domestic														
Albacore			62		108		34	8,098	14,857	7,027	10,470	13,996	6,853	10,889
Skipjack tuna	918	292	387	45	15,388	19,669	3,406	116,085	98,122	101,837	155,118	160,981	103,689	126,429
Yellowfin tuna[1]	1,339	1,087	3,864	538	16,980	15,128	4,762	120,555	127,253	122,132	120,634	112,080	138,064	120,531
Subtotal	2,257	1,379	4,313	583	32,476	34,797	8,202	244,738	240,232	230,996	286,222	287,057	248,606	257,849
Imported[2]														
Albacore								83,811	87,297	94,598	72,855	92,844	95,152	86,281
Skipjack tuna								208,631	188,009	128,015	135,308	134,873	92,632	158,967
Yellowfin tuna[1]								74,473	83,588	51,213	38,332	41,730	67,361	57,867
Subtotal								366,915	358,894	273,826	246,495	269,447	255,145	303,115
Grand total	2,257	1,379	4,313	583	32,476	34,797	8,202	611,653	599,126	504,822	532,717	556,504	503,751	560,964

[1]Includes bigeye, blackfin, and bluefin tuna.
[2]Includes only imported tuna destined for canning; excludes tuna imported as flakes, tuna not fit for human consumption, and "sushi" grade tuna.
[3]Includes tuna landed directly or transshipped to a foreign country; excludes tuna exported from the east coast.
Source: Statistics and Market News, Southwest Region, NMFS, NOAA.

Table 2.—U.S. domestic tuna cannery receipts and direct exports[1] (short tons) by ocean of origin, 1980-85 (none from Indian Ocean).

Species	Albacore							Skipjack tuna						
	1980	1981	1982	1983	1984	1985	80-84 Avg.	1980	1981	1982	1983	1984	1985	80-84 Avg.
E. Atlantic	2	2	62				13	2,458	3,327	27	21			1,167
W. Atlantic	18	4		4		1	5	25	108		3	944	2,079	216
E. Pacific	7,690	13,954	5,099	9,434	13,409	6,021	9,917	101,344	74,116	59,264	40,181	22,359	4,992	59,453
W. Pacific	388	897	1,866	1,032	587	831	954	12,258	20,571	42,546	114,913	137,678	96,618	65,593
Total	8,098	14,857	7,027	10,470	13,996	6,853	10,889	116,085	98,122	101,837	155,118	160,981	103,689	126,429

Ocean	Yellowfin tuna[2]							Total						
	1980	1981	1982	1983	1984	1985	80-84 Avg.	1980	1981	1982	1983	1984	1985	80-84 Avg.
E. Atlantic	1,898	1,966	1,087				990	4,358	5,295	1,176	21			2,170
W. Atlantic	517	502	115	70	1,550	4,185	551	560	614	115	77	2,494	6,265	772
E. Pacific	116,947	110,251	96,640	65,863	60,753	101,897	90,091	225,981	198,321	161,003	115,478	96,521	112,910	159,461
W. Pacific	1,193	14,534	24,290	54,701	49,777	31,982	28,899	13,839	36,002	68,702	170,646	188,042	129,431	95,446
Total	120,555	127,253	122,132	120,634	112,080	138,064	120,531	244,738	240,232	230,996	286,222	287,057	248,606	257,849

[1]Includes tuna landed directly or transshipped to a foreign country; excludes tuna exported from the east coast.
[2]Includes bigeye, blackfin, and bluefin tuna.
Source: Statistics and Market News, Southwest Region, NMFS, NOAA.

lowfin tuna (the light meat species that commands the highest ex-vessel price in both domestic and foreign markets) led to a resurgence of U.S. fishing in the eastern Pacific Ocean during 1985. A record catch of yellowfin tuna (218,920 tons)

Table 3.—U.S. imported tuna cannery receipts[1] (short tons) by ocean of origin, 1980-85.

Ocean	Albacore							Skipjack tuna						
	1980	1981	1982	1983	1984	1985	80-84 Avg.	1980	1981	1982	1983	1984	1985	80-84 Avg.
E. Atlantic	14,567	17,105	19,815	16,935	27,392	30,655	19,163	40,318	67,011	49,417	34,358	35,882	10,828	45,397
W. Atlantic	15,016	16,894	21,129	16,127	17,209	25,486	17,275	6,546	8,754	17,119	18,070	9,059	20,650	11,910
E. Pacific	418	22	48	243	439		234	23,981	9,409	11,916	4,501	9,245	17,146	11,810
W. Pacific	36,808	43,638	35,374	23,226	32,340	28,667	34,277	132,283	95,119	44,017	72,742	72,699	30,427	83,372
Indian	17,002	9,638	18,232	16,324	15,464	10,344	15,332	5,503	7,716	5,546	5,637	7,988	13,581	6,478
Total	83,811	87,297	94,598	72,855	92,844	95,152	86,281	208,631	188,009	128,015	135,308	134,873	92,632	158,967

Ocean	Yellowfin tuna[2]							Total						
	1980	1981	1982	1983	1984	1985	80-84 Avg.	1980	1981	1982	1983	1984	1985	80-84 Avg.
E. Atlantic	6,589	19,561	9,320	4,618	3,258	5,075	8,669	61,474	103,677	78,552	55,911	66,532	46,558	73,229
W. Atlantic	2,194	5,200	3,058	6,446	3,259	10,910	4,031	23,756	30,848	41,306	40,643	29,527	57,046	33,216
E. Pacific	30,891	16,039	19,200	7,492	9,222	29,572	16,569	55,290	25,470	31,164	12,236	18,906	46,718	28,613
W. Pacific	34,060	41,340	18,800	18,814	23,799	15,262	27,363	203,151	180,097	98,191	114,782	128,838	74,356	145,012
Indian	739	1,448	835	962	2,192	6,542	1,235	23,244	18,802	24,613	22,923	25,644	30,467	23,045
Total	74,473	83,588	51,213	38,332	41,730	67,361	57,867	366,915	358,894	273,826	246,495	269,447	255,145	303,115

[1]Includes only imported tuna destined for canning; excludes tuna imported as flakes, tuna not fit for human consumption, and "sushi" grade tuna.
[2]Includes bigeye, blackfin, and bluefin tuna.
Source: Statistics and Market News, Southwest Region, NMFS, NOAA.

was reported from the Inter-American Tropical Tuna Commission's yellowfin regulatory area. The U.S. fleet accounted for almost 39 percent of the eastern Pacific yellowfin tuna catch in 1985, an amount representing the largeset contribution to domestically caught light meat tuna cannery receipts by oceanic area for the year.

The loss of west coast and Hawaii processing capacity and a significant increase in imports of foreign packed tuna contributed to a decrease in overall U.S. canned tuna production (27.9 million standard cases[4]) of 11 percent from 1984 (Table 4). When canned imports were combined with U.S. production, the total addition to U.S. canned supplies in 1985 was 38.9 million standard cases, a 2 percent decline from that in 1984 (Table 4). Canned imports set a new record in 1985, reaching 11.0 million standard cases. This represents a 32 percent increase from 1984 and an increase of 237 percent since 1980. Imports were dominated by tuna packed in water which is subject to a much lower import duty than tuna packed in oil.

Table 4.—U.S. supply of canned tuna, volume and value, 1975-85.

Year	Case pack supply (1,000 standard cases)[1]						
	Domestic production[2]				Canned imports[3]	%	Total
	White	%[4]	Light	%			
1975	5,296	17.8	21,854	73.3	2,650	8.9	29,800
1976	6,312	18.7	24,416	72.3	3,020	9.0	33,748
1977	6,559	21.9	21,544	72.1	1,776	6.0	29,879
1978	7,528	19.4	28,615	73.8	2,655	6.8	38,798
1979	6,129	17.7	25,678	74.3	2,754	8.0	34,561
1980	5,825	17.1	25,049	73.4	3,259	9.5	34,133
1981	6,204	17.3	25,948	72.5	3,633	10.2	35,785
1982	6,416	20.0	21,199	66.0	4,491	14.0	32,106
1983	5,444	14.9	24,844	68.0	6,273	17.1	36,561
1984	7,012	17.6	24,489	61.5	8,324	20.9	39,825
1985	6,764	17.4	21,185	54.4	10,972	28.2	38,921
	Case pack value ($1,000)						
1975	136,678	19.6	515,957	73.8	45,951	6.6	698,586
1976	212,869	23.1	640,594	69.6	67,502	7.3	920,965
1977	240,734	25.3	665,880	70.0	44,658	4.7	951,272
1978	296,506	22.2	976,754	73.0	63,822	4.8	1,337,082
1979	243,851	20.9	859,998	73.6	65,071	5.5	1,168,920
1980	252,290	20.3	891,237	71.9	97,254	7.8	1,240,781
1981	294,292	22.8	885,846	68.6	110,359	8.6	1,290,497
1982	275,400	26.7	643,046	62.3	113,346	11.0	1,031,792
1983	197,011	19.8	661,586	66.4	137,324	13.8	995,921
1984	255,997	24.6	616,280	59.3	167,268	16.1	1,039,545
1985	269,887	26.2	550,882	53.5	209,138	20.3	1,029,907

[1]For ease of comparison a standard case will represent 48 6.5-ounce cans or 19.5 pounds.
[2]Sources: U.S. Department of Commerce. 1976-86. Fisheries of the United States, 1976-85. Curr. Fish. Stat. 6900, 7200, 7500, 7800, 8000, 8100, 8200, 8300, 8320, 8360, 8380. Var. pagin. U.S. Department of Commerce. 1975-85. Canned fishery products, 1975-84. Curr. Fish. Stat. 6701, 6901, 7201, 7501, 7801, 8001, 8101, 8201, 8301, 8319, 8359. Var. pagin.
[3]Source: U.S. Department of Commerce, Bureau of the Census computerized data files, 1974-85.
[4]A percent symbol (%) denotes the percent of total for each canned category.

[4]For ease of comparison, a standard case will consist of 48 6.5-ounce cans or 19.5 pounds. In 1985, processors began packing albacore (white meat) tuna in 6.5 ounce cans rather than 7.0 ounce cans. Therefore, a standard case of white meat tuna decreased from 21.0 pounds to 19.5 pounds.

Two pieces of legislation aimed at eliminating the tariff difference between

imports of canned tuna in water and canned tuna in oil were introduced into the U.S. House of Representatives during 1985. In a related matter, the U.S. Trade Representative called on the International Trade Commission (ITC) to conduct a "332 investigation" on the competitive conditions within the U.S. tuna industry. The ITC had completed, in 1984, a "201 investigation" of canned tuna imports in response to a petition from certain segments of the U.S. tuna industry seeking tariff relief from imports of canned tuna packed in water[5].

The U.S. consumer continued to benefit from competition between foreign and domestically produced canned tuna. The retail composite canned tuna price, which decreased 3 percent during 1984, fell an additional 2 percent in 1985. The downward price trend contributed to corresponding growth in overall apparent consumption which increased about 3 percent in 1985, following a 2 percent increase for all of 1984. Sales of water-packed products (except in the health/diet category) increased 6 percent in 1985. Since water-packed products account for more than 60 percent of total sales, this increase helped offset reduced sales of tuna in oil and of health/diet canned tuna products.

U.S. consumers are also developing a taste for fresh and fresh-frozen tuna products. Fresh albacore tuna has become increasingly popular in the restaurant and retail trade. There is also a growing domestic market for high quality, fresh tropical tuna species, which has stimulated development of fresh-fish tuna fisheries on the U.S. east and west coasts, in the Gulf of Mexico, and in Hawaii.

In the following sections we review the 1985 production of white and light meat tuna by the U.S. tuna industry and consumption of tuna products by U.S. consumers. In the final section the economic performance of the U.S. tropical tuna purse seine fleet is analyzed over the period 1979-83. Unless otherwise noted, the information and data presented herein were compiled by the Statistics and Market News Section of the Southwest Region, National Marine Fisheries Service (NMFS).

Albacore Production

Albacore, which is the only species that may be canned as white meat tuna in the United States[6], accounted for about 24 percent of total U.S. canned production in 1985. According to industry reports, consumption of canned white meat tuna packed in water had increased 2 percent in 1985, while consumption of canned white meat packed in oil, which had shown a gain for 1984, fell 4 percent during 1985. Total cannery receipts—domestically caught albacore plus imports—reached 102,005 tons in 1985, 5 percent below receipts for 1984 but 5 percent above the 1980-84 average (Table 1). Domestic white meat production for 1985 amounted to 6.8 million standard cases (Table 4), 4 percent below production in 1984.

Cannery Receipts of Domestically Caught Albacore

The U.S. albacore fishery presently occurs almost entirely in the Pacific Ocean north of lat. 25°N and offshore from the west coast to about long. 180°. This area is divided at long. 140°W into offshore (mid-Pacific) and inshore fishing areas. Troll (jig) gear is the dominant gear used in the U.S. fishery.

As a result of the 1984 cannery closures, U.S. albacore fishermen opened the 1985 season faced with the virtual disappearance of their usual markets. This was refelcted in the volume of domestically caught albacore delivered to U.S. canneries in 1985 which totaled 6,853 tons, 51 percent below the corresponding figure for 1984. This represents the lowest volume over the last 5 years (Table 1). The loss of cannery markets, particularly in Hawaii, resulted in only 17 vessels participating in the mid-Pacific albacore fishery during 1985, a 62 percent decrease in the number from 1984. However, even with a reduced number of vessels, 825 tons of domestically caught albacore cannery receipts were landed in Hawaii and transshipped to California, an increase of 40 percent from 1984. Receipts of domestically caught albacore from the inshore area decreased 55 percent from 1984 which, in view of relatively unchanged catch rates from 1984, reflects a significant decrease in inshore fishing effort.

Compounding the difficulties brought about by the U.S. cannery closures was a generally abundant supply of albacore being offered through the international market during 1985, a situation which had contributed to a significant decline in ex-vessel prices by mid-year. For domestically caught albacore delivered to U.S. canneries, contract prices started out at $1,300 per ton for fish 9 pounds or greater, and $950 per ton for fish under 9 pounds, decreases of 7 and 15 percent, respectively, from prices at the beginning of 1984. By the end of the year prices had fallen to $1,000 per ton for large fish and $800 per ton for small fish, the lowest they have been in the past 5 years (Table 5).

With the substantial decline in both domestically caught receipts and ex-vessel prices, aggregate ex-vessel revenue from the 1985 albacore fishery fell 56 percent from that of 1984. Dividing ex-vessel albacore revenue by total cannery deliveries of U.S.-caught albacore yields a weighted ex-vessel price of $1,087 per ton for 1985 which is a 13 percent drop from 1984 (Table 6).

Considering the diminished opportunities for direct sales to U.S. canneries, domestic albacore fishermen continued to explore alternative opportunities for marketing their catches. The potential for fresh albacore sales was recognized in 1982 when fishermen started selling albacore off their boats after U.S. procesors had drastically curtailed their purchases of domestically caught fish. From this early, fragmented effort grew a more concerted attempt on the part of the albacore sector of the U.S. tuna industry to develop alternatives to the cannery market with emphasis on the development of fresh and fresh-frozen albacore products for the retail and restaurant trade.

The National Marine Fisheries Service has supported development of the U.S. albacore fishery through the Saltonstall-

[5]See S. F. Herrick, Jr., and S. J. Koplin. 1985. U.S. tuna trade summary, 1984. Admin. Rep. SWR-85-6. Southwest Region, National Marine Fisheries Service, NOAA, Terminal Isl., Calif.

[6]21 U.S. Code of Federal Regulations. Section 161.190 (a) (4) (i). U.S. Gov. Print. Off. 1985).

Table 5.—U.S. cannery ex-vessel (contract) prices (dollars per short ton) at California and Puerto Rico, 1980-85.

	Albacore			Skipjack tuna				Yellowfin tuna				
Year	>18 lb.	9-18 lb.	<9 lb.	>7.5 lb.	4-7.5 lb.	3-4 lb.	<3 lb.	>20 lb.	7.5-20 lb.	4-7.5 lb.	3-4 lb.	<3 lb.
1980	1,610	1,610	1,610	850	850	700	545	950	950	810	810	810
	1,635	1,635	1,635	1,100	1,100	1,000	800	1,200	1,200	1,100	1,100	1,100
1981	1,800	1,800	1,800	1,100	1,100	1,000	800	1,200	1,200	1,100	1,100	1,100
1982	1,425	1,425	1,425	1,100	1,100	1,000	800	1,200	1,200	1,100	1,100	1,100
				1,040	1,040	940	740	1,140	1,140	1,040	1,040	1,040
	1,350	1,225	1,000	890	890	700	500	1,170	1,050	890	890	890
1983[1]				950	850	700	420	1,230	1,050	850	700	420
	1,250	1,250	975	900	800	640	420	1,125	990	800	640	400
				880	780	585	250	1,125	975	780	585	250
1984[1]	1,400	1,400	1,125	830	730	500	250	1,085	950	730	500	250
				850	750	550	250	1,000	900	750	550	250
	1,150-1,300	1,150-1,300	875-1,025	763	650	470	235	925	800	650	470	235
1985[1]				708	610	435	200	865	753	610	435	200
	1,300	1,300	950	738	640	500	275	870	758	640	500	275
	1,150	1,150	800	650	590	490	290	815	715	590	490	290
	1,000	1,000	800	700	630	500	300	825	725	630	500	300

[1]Skipjack and yellowfin tuna prices are for standard grade; prices may vary due to quality.
Source: Statistics and Market News, Southwest Region, NMFS, NOAA.

Table 6.—U.S. cannery ex-vessel (weighted) prices (dollars per short ton), 1980-85.

	Albacore		Skipjack tuna		Yellowfin tuna	
Year	Nominal	Real[1]	Nominal	Real[1]	Nominal	Real[1]
1980	1,659	930	1,063	596	1,180	661
1981	1,800	920	1,030	527	1,170	598
1982	1,387	669	965	465	1,123	542
1983	1,268	589	799	371	1,032	479
1984	1,252	560	760	340	982	440
1985	1,087	469	622	269	820	354

[1]Adjusted for inflation using GNP implicit price deflator (1972=100).
Source: Statistics and Market News, Southwest Region, NMFS, NOAA.

Kennedy Program[7]. Over the last 4 years more than $530,000 in Saltonstall-Kennedy fishery development funds has been awarded to the albacore fishery, almost half of which has been earmarked for research on increasing opportunities for fresh and fresh-frozen albacore consumption. Much of this research has been directed toward upgrading handling and processing techniques to provide a product suitable for the fresh fish market. Other research has been aimed at developing different albacore products.

According to industry sources, about 1,200 tons of domestically caught albacore were channeled through the albacore alternative marketing program during 1985 (W. Perkins, Western Fishboat Owners Association, personal commun.). Ex-vessel prices reportedly ranged from under $1,000 per ton to $1,300 per ton with an average of $1,200 per ton, which was 10 percent higher than the weighted average cannery price.

In addition to sales through the alternative fresh fish market, almost 700 tons of domestically caught albacore was exported during 1985 to France, Japan, and Thailand[8] (G. K. Alameda, Ocean Venture, Inc., personal commun.). There appears to be a strong potential for expanding albacore exports to Japan where it is processed for Japan's canned tuna market. Like the U.S. market for fresh albacore, the key to success in exporting to Japan is the ability to provide high quality fish, because the Japanese are extremely sensitive about the aesthetic and gustatory qualities of the canned tuna they consume.

Production of Canned White Meat Tuna

The primary U.S. tuna receiving and processing sites during 1985 were Mayaguez and Ponce, Puerto Rico; San Pedro, Calif.; Honolulu, Hawaii; and Pago Pago, American Samoa. For reporting purposes, tuna receipts and production data are combined for American Samoa, California and Hawaii (AmS/Ca/Hi). Data for Puerto Rico are reported separately[9].

Seventy-five percent of the raw albacore supplied to U.S. canneries in 1985 (102,005 tons) was delivered to canneries in Puerto Rico and the balance to canneries in AmS/Ca/Hi. This represented a 3 percent increase from 1984 in albacore deliveries to Puerto Rico and a 21 percent decline in deliveries to AmS/Ca/Hi. Of the total 1985 domestically caught albacore receipts, 82 percent, or 5,608 tons, was received in AmS/Ca/Hi and the remainder, 1,245 tons, was transshipped from west coast ports to canneries in Puerto Rico (Table 1). This was a 46 percent reduction from 1984 in domestically caught albacore deliveries to AmS/Ca/Hi, and a 65 percent decrease in domestically caught albacore transshipments to Puerto Rico.

U.S. cannery receipts of imported raw albacore totaled 95,152 tons in 1985, a 2

[7]The Saltonstall-Kennedy Act (15 U.S.C. 713c-2-713c-3) makes available to the Secretary of Commerce up to 30 percent of the gross receipts collected under the customs laws from duties on fishery products. The Secretary must use at least 60 percent of these funds each year in the form of grants to assist persons in carrying out research and development projects which address any aspect of U.S. fisheries.

[8]U.S. albacore exports do not appear under direct exports in Table 1 because albacore exported in 1985 was initially landed in the United States and then exported through brokers. Mention of trade names or commercial firms does not imply endorsement by the National Marine Fisheries Service, NOAA.

[9]Although no tuna was processed in Hawaii during 1985, Hawaii was a receiving/transshipping site for tuna destined for U.S. canneries in 1985. Tuna transshipped through Hawaii during 1985 is recorded as a receipt at its cannery destination. The AmS/Ca/Hi designation is maintained for 1985 in order to make historical comparisons.

Table 7.—Cannery imports of frozen tuna (short tons) by country of origin, 1980-85.

	1980		1981		1982		1983		1984		1985	
Origin[1]	White	Light[2]	White	Light	White	Light	White	Light	White	Light	White	Light
Brazil	109	5,847	83	5,968	1,443	16,181	1,185	15,154	2,018	7,743	710	15,282
Canary Island	362		325		1,693	1	7,653	5	14,030	10	9,415	16
Caymen Island				2,171		6,723				9,960		11,031
Ecuador	340	10,661						2,809		12,034		18,722
Ghana	70	30,071	760	36,188	1,078	27,783	345	23,751	170	6,640		
Ivory Coast		12,860	345	35,805		27,862		13,783	289	30,997		15,887
Japan	3,957	45,112	6,483	12,307	5,834	12,705	696	18,426	10,946	20,965	6,754	718
Mauritius	4,349		1,364	152	4,811		4,668		5,026		5,789	
Netherl. Antilles	6,611	4,869	6,202	273	10,054	1,996	8,560	258	9,619	298	12,110	197
Panama		27,660		23,746		29,558	1	8,110	424	13,928		15,138
Philippines	37	26,799		20,781		5,923		6,476		1,327		
Reunion	9,209	157	4,738	204	12,036	146	7,438	3	4,363	67	1,521	756
Seychelles								3,042		8,257	262	17,064
Singapore	3,444	5,366	3,969	7,781	1,386	3,846	4,217	3,761	5,024		2,562	
Solomon Island	1,088	18,984		22,618		928		10,600		15,836		3,390
South Africa	14,136	263	15,091	1,832	17,044	1	7,304	239	11,856	1,478	21,101	
South Korea	412	925	1,547	4,893	1,001	6,891	5,374	13,830	2,119	11,064	8,874	9,747
Taiwan		244	1,730	169	99	384	5,075	3,851	9,739	9,468	5,947	10,592
Uruguay	7,903	1,719	9,920	1,489	8,835	670	4,480	143	3,228	722	7,425	1,997
Venezuela		865	394	5,496		2,421	1	6,604		7,002	147	33,538
Other	31,784	90,702	34,346	89,724	29,285	35,209	15,858	42,795	13,993	18,807	12,535	5,918
Totals	83,811	283,104	87,297	271,597	94,599	179,228	72,855	173,640	92,844	176,603	95,152	159,993

[1]Data reflects the origin of shipments and not necessarily the flag of the catcher vessel.
[2]Light meat includes bigeye, blackfin, bluefin, skipjack, and yellowfin tuna.
Source: Statistics and Market News, Southwest Region, NMFS, NOAA.

percent increase from 1984 (Table 1). Imports accounted for 93 percent of the 1985 total cannery supply of albacore compared with 87 percent in 1984. Puerto Rico was the major receiving site for imports with 75,122 tons or 79 percent of total albacore imports; AmS/Ca/Hi received the remainder. Albacore imports received in Puerto Rico during 1985 increased 6 percent from 1984, while imports received in AmS/Ca/Hi decreased 9 percent. The leading exporter of raw albacore to U.S. canneries in 1984 was South Africa[10], a major transshipping base for Japanese and Taiwanese albacore vessels, with 21,101 tons or 22 percent of the total imports (Table 7).

Imports of raw albacore received at U.S. canneries in 1985 were valued at about $153 million[11], up 6 percent from 1984. Dividing this value by the corresponding volume yields a weighted average import price of $1,611 per ton for raw albacore in 1985, nearly 3 percent above that for 1984.

In 1985, 55 percent of the total U.S. cannery supply of raw albacore came from the Atlantic Ocean, followed by the Pacific and Indian Oceans which contributed 35 and 10 percent, respectively, to the total supply. Virtually all of the albacore received from the Atlantic and Indian Oceans consisted of imports. Receipts of albacore from the Atlantic Ocean increased 26 percent from 1984, those from the Pacific decreased 24 percent, and those from the Indian Ocean fell 33 percent (Tables 2 and 3).

During 1985, wholesale list prices for U.S.-produced, nationally-advertised brands of white meat tuna ranged between $55.57 and $60.63 per standard case. With discounts, the actual selling price at wholesale was as low as $45.20 for a standard case which, when considering the decrease in size of a standard case, represented an increase of 7 percent over 1984. Production of both advertised and private brands of white meat tuna was valued at about $270 million (free on board plant value) in 1985, up 5 percent from 1984. Based on total white meat volume, the weighted average value in 1985 was $39.89 per standard case compared with $36.51 for the equivalent size case in 1984, a 9 percent increase.

Production of Light Meat Tuna

Although U.S. consumption of all light meat tuna products showed an overall increase in 1985, production of canned light meat tuna by U.S. processors during 1985 decreased considerably from 1984. In 1985, consumption of oil-packed, light meat tuna decreased 3 percent, but consumption of canned, light meat tuna packed in water increased nearly 7 percent based on relative market shares. This led to an overall increase in light meat consumption of about 4 percent for 1985. Cannery production of all light meat products totaled 21.2 million standard cases in 1985, a decrease of 13 percent from 1984. (Table 2). The total cannery supply of raw light meat tuna for 1985 was 366,949 tons, down 12 percent from 1984 (Table 1). Prices of light meat tuna at the ex-vessel, wholesale, and retail levels continued to decline during 1985.

Cannery Receipts of Domestically Caught Light Meat Tunas

The U.S.-flag, tropical tuna fleet consisted of 130 vessels with an overall carrying capacity of 113,394 tons at the beginning of 1985: 109 purse seiners and 21

[10]The exporting country reflects origin of shipments and not necessarily the flag of the catcher vessel.
[11]The values of raw imported tuna (white and light meat) provided herein are based on the average prices reported by importers to the Bureau of the Census, and volumes of imports compiled by the Statistics and Market News Service, NMFS Southwest Region.

baitboats (pole and line gear). By the end of 1985 the fleet had declined to 110 vessels, 92 purse seiners and 18 baitboats with a total carrying capacity of 99,594 tons, a 12 percent decrease from 1984. However, 36 of these 110 vessels were listed as inactive, and 21 of the inactive vessels were seiners having individual carrying capacities of 400 tons or more.

During 1985, the fleet operated almost exclusively in the Pacific Ocean. There were 39 vessels active in the western Pacific at the beginning of 1985 with a combined carrying capacity of 47,345 tons. The number in the western Pacific declined to 33 by the end of 1985 with a capacity of 40,675 tons, a 15 percent decrease in number and a 14 percent decrease in total capacity. Forty-three vessels with a total carrying capacity of 36,544 tons operated in the eastern Pacific during the first quarter of 1985, declining to 42 vessels with a capacity of 34,709 tons by the end of the year. This represented a decrease of 2 percent in the number of vessels and a decrease of 5 percent in carrying capacity. Only four U.S.-flag vessels, having a combined capacity of 4,380 tons, fished in the Caribbean area of the Atlantic Ocean during 1985.

Receipts of domestically caught, light meat tuna at U.S. canneries totaled 206,956 tons in 1985, 14 percent below receipts for 1984. This total comprised 84,020 tons of skipjack tuna and 122,936 tons of yellowfin tuna (includes bigeye, bluefin, and blackfin tuna), a decrease of 35 percent in skipjack deliveries and an increase of 30 percent in yellowfin deliveries from 1984. As indicated previously, improved yellowfin tuna fishing in the eastern Pacific, and economic conditions were major factors contributing to the substantial shift from skipjack to yellowfin in deliveries by the fleet during 1985. In addition to deliveries to U.S. canneries, U.S. flag vessels exported 34,797 tons of light meat tuna to foreign canneries in 1985, up 7 percent from 1984 (Table 1).

At the beginning of 1985, contract ex-vessel prices (without quality adjustments[12]) for light meat in all species and size categories were sharply below corresponding prices for 1984 and, except for the smaller size categories (skipjack and yellowfin four pounds or less), year-end prices were lower than opening prices (Table 5). The observed increase in contract price for smaller light meat tuna can perhaps be ascribed to a greater demand for smaller tuna at offshore processing sites where, for a given quantity of canned product, the relatively low cost of the additional labor required to process comparatively lower yielding small fish results in an overall cost saving.

Receipts of domestically caught skipjack tuna were valued at $52 million in 1985, down 53 percent from 1984. This yields a weighted ex-vessel price of $622 per ton, an 18 percent decrease from 1984. Domestic deliveries of yellowfin tuna generated about $101 million in ex-vessel revenue for 1985, 8 percent above 1984. The weighted ex-vessel price for yellowfin tuna in 1985 was $820 per ton, a decrease of 17 percent from 1984 (Table 6). Total ex-vessel revenue was approximately $153 million in 1985, 25 percent less than 1984 ex-vessel revenue.

Production Of Canned Light Meat Tuna

In the United States, skipjack, yellowfin, bigeye, and bluefin tuna are collectively canned as light meat tuna. The 6.5-ounce can of chunk style, light meat tuna in water was the most popular tuna product consumed in the U.S. during 1985, accounting for over 43 percent of all tuna sales.

During 1985, 366,949 tons of raw, light meat tuna were delivered to U.S. canneries in Puerto Rico, American Samoa, and California (Table 1). Puerto Rico received 236,673 tons in 1985, 64 percent of the total; the balance, 130,276 tons, was received at canneries in American Samoa and California. Total receipts for Puerto Rico increased 7 percent from 1984 and decreased 33 percent for American Samoa and California (Table 1) reflecting the loss of west coast processing capacity that occurred during 1984.

Domestically caught, light meat tuna deliveries to canneries in Puerto Rico during 1985 reached 104,875 tons, 51 percent of the total domestically caught, light meat deliveries for 1985. The remainder, 102,081 tons, went to canneries in American Samoa and California. Compared with 1984, domestically caught, light meat tuna deliveries to Puerto Rico increased 21 percent, while deliveries to American Samoa, California, and Hawaii decreased 34 percent (Table 1). Imports of light meat tuna totaled 159,993 tons in 1985, 9 percent below the level of imports for 1984. Imports made up 44 percent of the total cannery supply in 1985 vs. 42 percent in 1984. Puerto Rico was the major receiving site for imports during 1985, accounting for 131,798 tons (82 percent of the total), a 3 percent decrease from 1984 (Table 1). Skipjack tuna made up 58 percent of the 1985 light meat imports with yellowfin tuna providing the balance. Overall, skipjack tuna imports were down 31 percent from 1984, while yellowfin tuna imports increased 61 percent.

Venezuela was the top exporter of raw light meat tuna to the United States in 1985 with 33,538 tons, 21 percent of the 1985 total. Ecuador followed with 18,722 tons, 12 percent of the total (Table 7).

Light meat imports in 1985 were valued at $127 million, down 7 percent from 1984. The value of skipjack tuna imports was about $66 million and the value of yellowfin tuna imports was about $61 million, a decrease from 1984 of 31 percent for skipjack tuna and an increase of 45 percent for yellowfin tuna. These values convert to weighted average prices of $708 per ton for imported skipjack tuna and $902 per ton for imported yellowfin tuna, an increase of about 1 percent and a decrease of 11 percent, respectively, from 1984.

The Pacific Ocean was the primary source of all light meat tuna cannery receipts and U.S. exports of light meat tuna in 1985 which totaled 401,746 tons. The Pacific provided 327,896 tons or 82 percent of this total, the Atlantic Ocean 13 percent, and the Indian Ocean 5 percent. On a regional basis, the western Pacific was the leading production area with 174,289 tons, 43 percent of total receipts and U.S. exports, even though total cannery receipts and direct exports from this area decreased 39 percent from 1984. Of the total receipts originating in the western Pacific during 1985, 74 percent

[12]Contract prices may be adjusted for salt content, temperature of the fish, and physical condition of the fish at unloading.

(128,600 tons which includes U.S. exports) was domestically caught and the remainder (45,689 tons) consisted of imports. Skipjack tuna was the predominant species in the western Pacific. Other oceanic regions contributing to the 1985 U.S. cannery supply and U.S. raw exports, in order of importance, were the eastern Pacific (primarily domestically caught yellowfin tuna), the western Atlantic, and the eastern Atlantic. For the first time, the Indian Ocean surpassed the eatern Atlantic as a source of light meat imports during 1985. This is a direct reflection of the shift by the Spanish and French fleets from their traditional eastern Atlantic waters into the western Indian Ocean. A breakdown of the 1984 cannery supply and U.S. exports by ocean of origin is given in Tables 2 and 3.

The wholesale list price of U.S. produced, advertised, light meat tuna ranged between $34.20 and $43.45 a standard case, but with discounts the price fell as low as $27.50 a case during the year. Total production of canned light meat tuna, both advertised and private label brands, was valued at $551 million (FOB plant value) in 1985, down 11 percent from 1984. This results in a weighted average value of $26.00 for a standard case of light meat tuna in 1985, an increase of 3 percent from 1984.

Canned Imports

Foreign processed canned tuna packed in oil is subject to a 35 percent tariff and therefore imports are negligible. Foreign processed canned tuna not in oil is under a tariff rate quota which allows imports of up to 20 percent of the previous year's domestic production, excluding American Samoa, to enter at 6 percent ad valorem; imports above the quota level enter at 12.5 percent ad valorem. Imports from American Samoa are not counted against the quota. Before the quota on canned imports not in oil is reached, the Bureau of the Census categorizes white meat and light meat imports separately. However, once the quota is reached, the Bureau of the Census no longer distinguishes between white and light meat imports. Thus, year-end figures comprise imports of both canned light and white meat not in oil.

In 1985, the quota on canned imports not in oil was 97.5 million pounds or 5.0 million standard cases. Total imports reached a record 214.3 million pounds or about 11.0 million standard cases, an increase of 32 percent from 1984 (Table 4). When the 1985 quota was reached on 7 May 1985, white meat made up 13 percent of the imports of canned tuna not in oil. Imports of canned tuna in oil, practically all light meat tuna, totaled 302,000 pounds or about 16,000 standard cases, an increase of 14 percent from 1984.

The leading exporter of canned tuna to the United States in 1985 was Thailand with 122.6 million pounds or 6.2 million standard cases. This was 57 percent of total imports and represents a 37 percent increase in imports from Thailand over 1984. The Philippines was a distant second with 30.8 million pounds or 1.6 million standard cases, 14 percent of the 1985 total.

Imports in 1985 were valued at about $209 million FOB, an increase of 25 percent from 1984. This converts to a weighted average price of $0.98 per pound or $19.11 per standard case which is 5 percent below that for 1984. The wholesale price, ex-warehouse New York, for skipjack tuna packed in Thailand ranged from $23.00 to $26.00 per standard case in 1985. Imports of canned tuna and their corresponding value by major exporting country are shown in Table 8.

Consumption

Consumption of canned tuna products in the United States for 1985 (excluding noncivilian consumption) was calculated to be 3.3 pounds per capita, 3 percent above 1984. An informal survey of industry members indicates that tuna was consumed at a ratio of about 20 percent white meat to 80 percent light meat. Based upon these figures, per capita consumption was about 0.66 pounds of white meat tuna and 2.64 pounds of light meat tuna. This converts to 1.6 standard cans of white meat tuna and 6.5 standard cans of light meat tuna per capita. When compared with consumption in 1984, based on the same consumption pattern, there was no change in white meat consumption and a 3 percent increase in light meat consumption.

Based on the National Marine Fisheries Service's "Operation Price Watch," (1984, 1985)[13] consumers paid an average of $1.42 per 6.5 ounce can for white meat tuna and $0.84 per 6.5 ounce can for light meat tuna during 1985 (although retail loss-leader promotions sometimes reduced light meat prices to $0.39 per can), a decrease of 3 percent for white and 2 percent for light meat from 1984. This resulted in an increase in estimated per capita expenditures on canned tuna in 1985—$7.73 compared with $7.54 in 1984.

Over the last several years, production and consumption of fresh bluefin, bigeye, and yellowfin tuna in the United States have increased substantially as evidenced by the rapid development of fresh fish fisheries off the U.S. east and west coasts, in the Gulf of Mexico, and in Hawaii. While these fisheries have mainly developed to meet a growing export demand for top-quality, sushi grade tuna, domestic demand also has increased with the growth of specialty seafood outlets and "sushi bars" in U.S. metropolitan areas.

Off the U.S. east coast, from Maine to Virginia, Atlantic bluefin tuna are harvested primarily for export to Japan. The Atlantic bluefin tuna fishery is highly regulated and catch quotas (by fish size and harvesting gear) are imposed through the International Commission for the Conservation of Atlantic Tunas. In 1985, U.S. fishermen, using a variety of gears including purse seine, longline, rod and reel, and handlines, landed 1,400 tons of Atlantic bluefin tuna. About 85 percent of the 1985 landings of "sushi" grade giant bluefin tuna caught using purse seine and longline gear was exported to Japan, with the remainder going to U.S. fresh fish markets (Northeast Fisheries Center, NMFS, personal commun.).

Spurred by a strong Japanese export market and increasing domestic demand, Atlantic and Gulf coast fishermen are directing more fishing effort to bigeye and yellowfin tuna. In 1985, domestic bigeye tuna landings destined for fresh consumption were about 370 tons, which exceeded 1984 landings by 9 percent. Fish-

[13]Operation Price Watch is based on an informal monthly survey of fish and other items in three retail grocery stores in each of 10 cities.

ermen received as much as $12,000 a ton for large, high-quality bigeye tuna exported to Japan in 1985 (Southeast Fisheries Center, NMFS, personal commun.). Landings of yellowfin tuna from both the southeast U.S. coast and Gulf of Mexico fisheries were also on the rise during 1985. Preliminary reports placed landings at 1,862 tons, with average ex-vessel prices ranging from $1,500 to $7,000 a ton depending on size and quality. This compares with landings of 565 tons at an average price of $2,080 per ton in 1984 (Southeast Region, NMFS, personal commun.).

A domestic fresh fish fishery for Pacific bluefin tuna on the U.S. west coast is also starting to develop. Landings in 1985 approached 610 tons and were valued at about $904,000. This fishery was almost nonexistent in 1984. Most of the west coast fresh bluefin tuna landings in 1985 were delivered to area restaurants. Besides supplying a strong local market, the Hawaiian fresh fish tuna fishery also delivers much of its catch to continental and export markets. Landings of fresh tuna from Hawaii totaled 2,950 tons worth $6.6 million in 1984. In 1985, U.S. imports of fresh tuna, primarily yellowfin, received in California amounted to 1,109 tons with a value of $5.8 million. This compares with imports of 871 tons having a value of $2.9 million in 1984.

Table 8.—U.S. imports for consumption by principal sources tuna in airtight containers (oil and water).

Source	1980	1981	1982	1983	1984	1985
	Quantity (1,000 pounds)					
Canada			2	2,106		88
Ecuador					890	5,175
Indonesia		146	595	2,634	2,222	1,388
Japan	24,794	21,271	26,481	20,387	26,855	23,703
Malaysia	66	696	755	3,083	1,608	3,878
Philippines	13,777	21,451	27,631	32,018	22,225	30,797
South Korea	127	31	49	68	82	58
Spain[1]	146	170	120	133	214	336
Taiwan	15,947	15,771	10,704	18,710	17,935	23,472
Thailand	6,405	10,315	18,667	39,930	89,685	122,666
Other	2,291	1,001	2,575	3,260	597	2,387
Total	63,553	70,852	87,579	122,329	162,313	213,948
	Value (1,000 dollars)					
Canada			5	2,986		75
Ecuador					837	4,676
Indonesia		209	699	2,679	2,102	1,186
Japan	42,015	36,453	38,561	24,643	29,186	28,142
Malaysia	76	1,230	1,242	4,068	1,893	4,498
Philippines	20,043	30,504	31,085	32,291	20,396	25,930
South Korea	189	58	79	69	75	58
Spain[1]	367	402	300	268	376	560
Taiwan	23,316	24,631	14,366	22,772	22,475	29,801
Thailand	8,875	15,400	22,711	43,259	89,253	111,852
Other	2,373	1,471	4,299	4,289	677	2,360
Total	97,254	110,358	113,347	137,324	167,270	209,138
	Unit value (per pound)					
Canada			$2.96	$1.42		$0.86
Ecuador					$0.94	0.90
Indonesia		$1.43	1.18	1.01	0.95	0.85
Japan	$1.69	1.71	1.46	1.20	1.09	1.19
Malaysia	1.14	1.77	1.64	1.32	1.18	1.16
Philippines	1.45	1.42	1.12	1.00	0.92	0.84
South Korea	1.48	1.86	1.63	1.02	0.91	0.99
Spain[1]	2.52	2.36	2.50	2.01	1.76	1.66
Taiwan	1.46	1.56	1.34	1.21	1.26	1.27
Thailand	1.39	1.49	1.22	1.08	1.00	0.91
Other	1.04	1.47	1.66	1.31	1.14	0.99
Average	1.53	1.56	1.29	1.12	1.03	0.98
	Percentage of total quantity					
Canada			***	2		***
Ecuador					1	2
Indonesia		***	1	2	1	1
Japan	39	30	30	17	17	11
Malaysia	***	1	1	2	1	2
Philippines	22	30	32	26	14	14
South Korea	***	***	***	***	***	***
Spain[1]	***	***	***	***	***	***
Taiwan	25	22	12	15	11	11
Thailand	10	15	21	33	55	57
Other	4	2	3	3	***	2
Total	100	100	100	100	100	100

***Less than 1 percent, included in "Other" listing.
[1]Mainly oil packed.
Source: Department of Commerce, Bureau of the Census.

Performance of the U.S. Purse Seine Fleet

Although changes in cannery deliveries, canned tuna production, prices, value, and consumption are useful indicators of conditions within the U.S. tuna industry, these measures form an incomplete picture in assessing the economic performance of the industry, because economic performance is also affected by the costs of producing output. Therefore, indicators that reflect changes in industry output and output prices over time relative to corresponding changes in input usage and input costs would provide a more complete picture of economic performance. To accomplish this, we developed a set of indices that account for changes in cannery deliveries, ex-vessel prices, inputs consumed, and input prices to examine relative changes in the economic performance of the U.S. tropical tuna purse seine fleet over the period 1979-83. The procedures used follow those reported in Norton et al. (1985) where the economic well-being of several different U.S. fishing fleets is evaluated over time through an overall performance index that incorporates changes in per unit output price, changes in input prices, and changes in fleet pro-

ductivity based on catch per unit of effort. For this study we constructed a composite purse seine fleet performance index from an aggregate output price index, an aggregate input price index, and a total factor productivity index.

The aggregate output price index in year "t" (t represents any of the years 1979-83) is the weighted average of the ratios of the ex-vessel prices for skipjack and yellowfin tuna in year "t" to their ex-vessel prices in 1979, the base year. The prices for skipjack and yellowfin tuna are the weighted ex-vessel prices described above. The weights used to compute the aggregate output price index in year "t" are the relative contributions of skipjack and yellowfin tuna revenues to total ex-vessel revenue in that year. Table 9 shows the price data and revenue share data used in calculating the aggregate output price index; the aggregate output price index is shown in Figure 1.

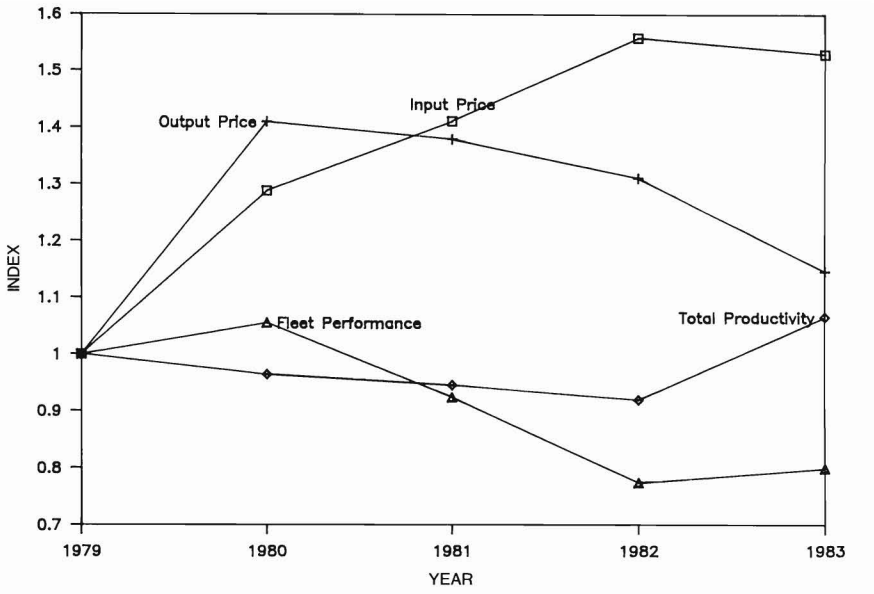

Figure 1.—Economic indexes for the U.S. tropical tuna purse seine fleet, 1979-83.

We computed the aggregate input price index using the same procedure as that for the aggregate output price index, that is, the ratio of the input prices in the year "t" to the input prices in the base year 1979 weighted by the relative contribution of the expenditure on each input in year "t" to total input expenditures. In this case, the inputs considered are labor, capital, fuel, and other intermediate inputs. Unit prices for these inputs over the period 1979-83 were estimated based on purse seine expenditure data reported by the U.S. International Trade Commission (ITC, 1984), data from the Inter-American Tropical Tuna Commission on days absent from port for the U.S. purse seine fleet, and annual average fuel prices from the American Tuna Boat Association (ATA, V. Bernadino, personal commun.).

The unit price of labor, cost per crew day absent, was estimated by dividing the sum of the ITC's reported annual per vessel expenditures on crew and galley by a measure of annual crew days absent per vessel. Annual crew days absent for U.S. purse seiners were derived by multiplying estimated total days absent per vessel by 19 crew members which is the assumed average crew complement in each year of the period.

The sum of the annual interest expense and reported depreciation per vessel from the ITC sample was used as the unit price of capital services in constructing the aggregate input price index.

Other intermediate inputs consist of transshipment services, repairs, gear, insurance, helicopter services, travel, and other. The sum of the nominal expenditures on these inputs per vessel was deflated by the producer price index for industrial commodities to represent the collective use of these inputs in real terms. The nominal expenditure for this category of inputs divided by the corresponding deflated expenditure is used as a proxy for the unit price for other intermediate inputs.

The weights used in calculating the aggregate input price index are the expenditures on each input category relative to the total expenditures on inputs. These weights are derived from the ITC expenditure data and are presented in Table 9 along with the price data used in constructing the aggregate input price index. The aggregate input price index is shown in Figure 1.

Changes in factor productivity, output per unit input, are accounted for through a total factor productivity index which is simply the ratio of an aggregate output index to an aggregate input index. The aggregate indexes of outputs and inputs are formed from Tornqvist-Theil (T-T) quantity indexes for each output produced and input used[14].

Annual output consists of the volume of domestically caught skipjack and yellowfin tuna delivered to U.S. canneries over the 1979-83 period. The number of purse seine vessels comprising the U.S. fleet in each of the years 1979-83 is used as a measure of capital stock. Aggregate labor usage is measured in crew days absent as described above. An estimate of annual fuel consumption by the fleet is obtained by dividing annual fuel expenditure per vessel from the ITC sample by average fuel prices provided by the ATA. Fuel consumption per vessel is then multiplied by the number of vessels in the fleet to get total fuel consumption. The quantity of other intermediate inputs used annually is approximated by deflating the nominal expenditure on this category of inputs by the producer price index for industrial commodities to obtain relative use in constant 1967 dollars. The quantity data used to construct the total factor productivity index is shown in Table 9

[14]For a discussion of the properties of such a total factor productivity index see Christensen (1975). An application of this type of total factor productivity index is given in Ball (1985).

Table 9.—U.S. purse seine fleet economic indexes, 1979-83.

Item and year	Quantity (tons)	Unit price	Revenue ($1,000)	Revenue share	T-T index
Outputs					
Skipjack tuna					
1979	96,582	728.00	70,312	0.36	1.0000
1980	116,085	1,063.00	123,398	0.46	1.0783
1981	98,122	1,030.00	101,066	0.40	1.0060
1982	101,837	965.00	98,273	0.42	1.0209
1983	155,118	799.00	123,939	0.50	1.2260
Yellowfin tuna					
1979	146,336	863.00	126,288	0.64	1.0000
1980	120,555	1,180.00	142,255	0.54	0.8920
1981	127,253	1,170.00	148,886	0.60	0.9170
1982	122,132	1,123.00	137,154	0.58	0.8956
1983	120,634	1,032.00	124,494	0.50	0.8958

Item and year	Quantity	Unit price	Expense ($1,000)	Expense share	T-T index
Inputs					
Capital (number of vessels)					
1979	125	336,000	42,000	0.20	1.0000
1980	122	440,000	53,680	0.19	0.9953
1981	119	625,000	74,375	0.25	0.9890
1982	121	780,000	94,380	0.28	0.9922
1983	108	725,000	78,300	0.28	0.9655
Labor (number of crew days absent)					
1979	575,206	114.0896	65,625	0.32	1.0000
1980	561,241	161.7273	90,768	0.33	0.9920
1981	565,003	143.0099	80,801	0.27	0.9947
1982	569,791	133.7859	76,230	0.23	0.9974
1983	460,940	139.4108	64,260	0.23	0.9409
Fuel (1,000's of gallons annually)					
1979	46,004	0.6820	31,375	0.15	1.0000
1980	60,783	0.8430	51,240	0.18	1.0470
1981	69,006	0.8450	58,310	0.20	1.0735
1982	78,354	0.8200	64,251	0.19	1.0948
1983	62,671	0.8220	51,516	0.18	1.0523
Other intermediate inputs (1967 dollars)					
1979	28,750	2.3652	68,000	0.33	1.0000
1980	30,256	2.7500	83,204	0.30	1.0162
1981	27,608	3.0431	84,014	0.28	0.9877
1982	33,275	3.1273	104,060	0.31	1.0479
1983	28,080	3.1615	88,776	0.32	0.9924

Item and year	Aggregate output price index	Aggregate output index	Aggregate input price index	Aggregate input index	Total factor prod. index	Fleet % index
Indexes						
1979	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1980	1.4100	0.9733	1.2879	1.0096	0.9640	1.0554
1981	1.3794	0.9561	1.4115	1.0066	0.9454	0.9239
1982	1.3115	0.9462	1.3580	1.0293	0.9192	0.7737
1983	1.1467	1.0479	1.5299	0.9830	1.0660	0.7990

Sources: Statistics and Market News, Southwest Region, NMFS, NOAA; U.S. International Trade Commission; Inter-American Tropical Tuna Commission.

together with the T-T indexes and the aggregate output and input indexes. The total factor productivity index is displayed in Figure 1.

By combining the aggregate output price index (*OPI*), the aggregate input price index (*IPI*), and the total factor productivity index (*TFPI*), a composite fleet performance index (*FPI*) for year "*t*" can be written as:

$$FPI_t = OPI_t * TFPI_t/IPI_t,$$

where the terms to the right of the equal sign are those indexes defined above. The *FPI* is an expression of the economic performance of the fleet in year "*t*" relative to the baseline year, 1979. Because the *FPI* is an aggregation of ratios of output prices, input prices, cannery deliveries, and input usage, it reflects the effect of a change in any of these factors throughout the period 1979-83. Any increase in the aggregate output price index or the total factor productivity index, or both, relative to the aggregate input price index, will register an improvement in fleet economic performance. Likewise, the *FPI* will decline given a rise in input prices relative to a decrease in output prices, vessel productivity, or both. The *FPI* shown in Figure 1 denotes the collective effect of changes in revenues, costs, and fleet productivity on fleet performance over the 1979-83 period.

Based on projections using the purse seine cost-earnings data from the 1984 ITC investigation, we found that the U.S. fleet experienced a net accounting loss in 1979, which is the base year used in calculating the fleet economic indexes. Therefore, when interpreting subsequent values of the *FPI*, one should keep in mind that a value greater than one in year "*t*" does not necessarily mean that the fleet realized a profit in that year. It means that it improved its economic performance relative to the base year—that is, the fleet could be earning a profit in "*t*"; the fleet could be just breaking even in year "*t*"; or the fleet is continuing to operate at a loss in year "*t*," although the loss will not be as great as in the base year. On the other hand, if the index in "*t*" is less than one, the fleet is performing worse than it did in the base year. Also, the indices are calculated for the fleet and therefore will not necessarily reflect the performance of an individual vessel. When a poorly performing vessel leaves the fleet, fleet performance may be enhanced due to an improvement in overall productivity.

Through 1980, the *FPI* improved due to a significant increase in the aggregate unit output price index which exceeded a substantial increase in the aggregate unit input price index and a slight decline in total factor productivity index. A decline in the aggregate output price index relative to an increase in the aggregate unit input price index and little change in the total factor productivity index led to a drop in the *FPI* for 1981. The *FPI* decreased further during 1982 as the output price and total factor productivity indices moved downward while the input price index continued to rise. Due to a substantial decrease in the size of the fleet and a significant increase in tropical tuna cannery deliveries, the total productivity index increased sharply

in 1983. Because this was accompanied by a slight decline in the aggregate input price index, the *FPI* rose despite a further decline in the aggregate output price index.

The changes in the indices over the 1979-83 period are not unexpected, given the developments in international supply and expansion of the fishery into more productive grounds. Ex-vessel prices have been depressed as the supply of raw tuna has increased, and at the same time input prices have continued to climb, which compels individual vessels to improve productivity to maintain overall performance. On a fleetwide basis, this is reflected in the total factor productivity index for 1983, the year in which there was a major push by the U.S. fleet into the western Pacific.

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