

SPECIES COMPOSITION OF U.S. TUNA IMPORTS FROM THE TEMA-BASED POLE-AND-LINE FLEET 1976-1985

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The U.S. National Marine Fisheries Service (NMFS) has an on-going biological sampling program of imports of Atlantic-caught tunas as part of an overall monitoring and research program required of members of the International Commission for the Conservation of Atlantic Tunas (ICCAT). Since its establishment in 1974, the program has generated a wealth of information on catches that are frequently not completely sampled prior to shipment to the U.S. Results of the program have been reported in several documents including Coan and Bartoo (1984), Coan, Weinfield and Holzapfel (1986), Foster and Holzapfel (1984), Sakagawa, Murphy and Coan (1976), and Sakagawa, Coan and Holzapfel (1977). Species composition information reported in these documents is aggregated for all import landings.

In this document we present disaggregated data, focusing on information for the pole-and-line fleet based in Tema, Ghana and a review of the relationship between this fleet and U.S. tuna processors. We believe that this information is necessary for evaluating the accuracy of the fleet's landing statistics by species, which has been a long-standing concern of ICCAT's scientific committee, and understanding the role of the NMFS sampling program.

Ghana and the Tuna Fishing Enterprise

The government of Ghana has been closely associated with tuna fishery developments in Ghana since 1959 through policies designed to stimulate economic independence and to reduce the country's dependence on fish imports (Lawson and Kwei 1974). In 1959 the government entered into a significant agreement with the U.S. tuna processor, Star-Kist Foods, Inc., for feasibility studies and assistance in developing a tuna fishing and processing industry in Ghana in exchange for exclusive rights, which included rights to operate a tuna cannery or processing plant and a 35-year monopoly to land, purchase or transship tuna in Ghana by foreign-flag vessels for cannery use or for export. This agreement, along with other government decrees, has had a lasting effect in shaping the tuna industry in Ghana.

Star-Kist performed a number of studies from 1959 to 1961, including fishing surveys for which U.S. purse seiners were employed to evaluate the economic feasibility of using the purse seining method in the Gulf of Guinea. The results were mixed and, by late 1961, it was clear that profits were not adequate for U.S. purse seiners to fish for tuna from a base in Ghana or for Star-Kist to operate a cannery in Ghana.

The socialist government in power at that time was disappointed with Star-Kist's decision because it wanted a large-scale tuna enterprise to be the cornerstone of its fishery policies (Lawson and Kwei 1974). Through its State Fishing Corporation, the government took an active role in financing new tuna purse seine construction, attempting to alter the exclusive provision of the Star-Kist agreement and engaging in direct fishing operations of tuna vessels -- in effect, to build a state-run tuna enterprise. All of these activities ended in failure for various reasons (Lawson and Kwei 1974), and in 1965 the government abandoned its active role.

In the meantime, Star-Kist pursued development of its transshipment operations. It built a frozen tuna transshipment facility at Tema in 1961, signed agreements to purchase tuna from Japanese longline vessels, arranged with Japanese companies to start a pole-and-line fishery, and surveyed potential fishing areas. Star-Kist operations were conducted from the port of Tema, where tuna were landed and held in cold storage for later transshipment aboard reefers to the U.S. and from where logistical assistance was provided to the fishing vessels.

Between 1962 and 1971, five to seven Japanese pole-and-line vessels were based in Tema for year-round tuna fishing. They were operated as a joint venture and produced 5,000 to 9,000 mt of tuna annually, most of which was transhipped to the U.S.

In 1966 a military coup took over the government in Accra and it governed until October 1969. Fishery policies underwent sweeping revision and the government dismantled the socialist structure. Civilian rule was reinstated in 1969, but was burdened with severe economic problems. Tuna development during this period was dominated by the activities of Star-Kist. Transshipment operations were expanded and by 1970, when civilian rule was firmly in place, Star-Kist had about 40 foreign tuna fishing vessels, mostly longliners, under contract and these vessels delivered about 22,000 mt of tuna (Folsom and Foster 1977).

The Ghanaian military again took control of the government in 1972. It instituted policies to stimulate the economy and to stabilize internal affairs. To bolster export trade in tuna, the government encouraged private-sector Ghanaian participation in catching and exporting tuna through joint-venture arrangements, renegotiated the Star-Kist agreement (Anon. 1974), and entered into agreement with another U.S. tuna processor (Van Camp Sea Food Company) to establish a transshipment base. As a result, several new joint ventures were established between Ghanaian and foreign interests. Most significant were ventures organized by the Ghanaian company, Mankoadze Fisheries Limited. This company

purchased pole-and-line vessels, expanded cold storage facilities in Tema, converted a herring/mackerel cannery into a tuna cannery, and invested in tuna purse seiners (Folsom and Foster 1977; Tettey 1986). These ventures also recruited a large number of foreign-flag fishing vessels to Tema. By 1978 the pole-and-line Tema-based fleet had grown to about 48 vessels with foreign registry of Japan, Korea and Panama primarily, and a few of Ghanaian registration (Wise 1986). The catch from this fleet was approximately 33,000 mt of tuna in 1978 and increased to a peak of 40,000 mt the following year. The major portion of the catch was transshipped as frozen fish to canning facilities in the U.S. and a small portion was sold locally or canned in Ghana.

In 1979, control over domestic affairs was concentrated in the Ghanaian supreme military command. A new fisheries law was adopted that tightened regulations on foreign fishing in Ghanaian waters and reinforced earlier provisions of fisheries decrees that mandated majority Ghanaian ownership of ventures for foreign fishing vessels operating in Ghanaian waters. It also imposed additional cost on foreign reefer vessels that used Tema for transshipment of tuna. This law quickly dampened foreign interest and precipitated the phase-out or withdrawal of foreign investment, but generated greater involvement of Ghanaian investors.

First to be affected was the Tema-based pole-and-line fleet, which was primarily composed of foreign-flag vessels. Vessels began leaving Tema for other bases beginning in 1980 and continuing into 1986 (Figure 1). Korean vessels completely withdrew or transferred to Ghanaian registration by July 1983 (Anon. 1985) and Japanese vessels withdrew or transferred registration by May 1984 (Kume 1985). By 1985 the Tema-based fleet had shrunk to 26 vessels and all had Ghanaian registration. The catch also had shrunk to 22,000 mt in 1985.

A new military government took control in 1981 and imposed reforms that further tightened currency and import controls, which severely affected operations of the tuna export enterprise. The controls discouraged investments required to maintain the antiquated port facilities of Tema, produced shortages of fuel and encouraged greater congestion in the harbor as more artisanal boats landed fish for the local market. Also, drought conditions in the interior of Ghana and other west African nations created severe shortages of food and caused people to immigrate into port cities like Tema. Theft, violence and civil disruption became widespread and prevented orderly discharging of catch and turn-around of the tuna vessels in Tema. The industry responded by relocating transshipment operations to the neighboring port of Abidjan, Ivory Coast, although the fleet continued to be based in Tema. Beginning in 1984, the entire fleet engaged in transactions in Abidjan (ICCAT 1985; 1986a), where the fish are mainly transshipped to canneries in the U.S. and western Europe. A part of the fleet's catch, particularly small, undersized tuna (smaller than 3.2 kg) unsuitable for export, is retained by the vessels and landed for the local market and cannery in Tema.

The U.S. Connection

The Ghana-U.S. connection was cemented by the 1959 agreement between Star-Kist and the government of Ghana and by private joint-venture arrangements, particularly between Mankoadze and Star-Kist (Tettey 1986). These agreements involved transshipment of tuna landings from Tema to the U.S., specifically to processing facilities in Puerto Rico. In the 1970s and early 1980s the tonnage amounted to 22,000 - 38,000 mt of tuna annually, out of a total tonnage of 30,000 - 40,000 mt landed in Tema (Folsom and Foster 1977). Since 1983, the tonnage has declined markedly as vessels have relocated transshipment operations to Abidjan and have been redeployed to other foreign ports (Table 1). A large part of the fleet's catch, however, continues to be purchased by U.S. processors.

Fish originating from Tema-based vessels arrive frozen at cannery facilities at Mayaguez, and up to the mid-1970s at Ponce, Puerto Rico too, aboard large reefer vessels. They are packed aboard the reefers in various arrangements -- individual fishing vessel catches kept together with netting and mixed loads designated as cold stores. Catches designated as cold stores are obviously fish from several catcher vessel landings that had accumulated in Tema before shipment.

Species Composition of Landings

Atlantic-caught tuna are sampled by NMFS in Puerto Rico. The fish are routinely sorted by hand into skipjack and combined yellowfin and bigeye by size lots aboard the reefer as they are unloaded and before they are transported into the cannery facilities. Observations in 1974 and 1975 indicated that sorting was a standard procedure and only occasionally were different species mixed in the lots (Sakagawa, Murphy and Coan 1976; Sakagawa, Coan and Holzapfel 1977). Sampling for species composition thus could be limited to only lots containing the combined yellowfin and bigeye tuna rather than to include all lots.

Beginning in 1976, a procedure of sampling only the combined yellowfin-bigeye tuna lots was instituted. Up to 100 fish were drawn from randomly selected lots and all fish were examined. Both external and internal (liver) parts were examined as necessary for species identification of each fish. Each fish was measured for fork length in order to calculate the weight of fish from length-weight tables.

The number of samples collected each year from the Tema-based pole-and-line landing ranged from 12 to 84 during 1976-1985 (Table 2). Yellowfin tuna was the dominant species (62-92% in weight) and bigeye tuna made up the balance (8-38%), aside from negligible amounts of other species.

We compared the proportion of yellowfin and bigeye in the samples to the proportion in reported catch statistics of ICCAT to examine species consistency. We combined statistics listed by ICCAT for baitboats (east Atlantic) of Ghana, Japan and Korea-Panama to arrive at total catch statistics for the Tema-based fleet (ICCAT 1986a, 1986b). The proportion of yellowfin tuna is consistently higher in the ICCAT statistics than in the NMFS samples until 1981, and then it varies with no particular trend (Table 3). The proportions from the two sources are statistically different at the 95% probability level ($X^2=4.65$, d.f. 9).

Significance of Findings

Bigeye tuna is an incidental species caught by the Tema-based pole-and-line fleet in the process of fishing for skipjack and yellowfin tuna in the Gulf of Guinea. It is a species that is not available in large numbers to the fleet so it is not particularly sought after. Nonetheless, it occurs in the catches at sizes (35-75 cm long) when their external appearance is similar to yellowfin tuna. Consequently, they are easily overlooked and mislabeled as yellowfin tuna.

In the U.S., the import landings arrive at canneries and are sorted into species-types and sizes at the time of unloading, before they are weighed and moved into storage facilities of the canneries. Deckhands unloading the landings are not trained to separate yellowfin from bigeye, but they are trained to separate skipjack from yellowfin or bigeye. This is done because the canneries pay less for skipjack and try to have uniform color in their pack, balancing the darker flesh of skipjack against the lighter flesh of yellowfin in processing runs. In general, they pay a higher but equivalent price for yellowfin and bigeye tuna, which are generally recorded collectively as "yellowfin tuna." The landing statistics of U.S. imports for skipjack tuna are, therefore, reasonably accurate, whereas the statistics for "yellowfin tuna" are not accurate because they include bigeye tuna.

The NMFS sampling for species composition is focused on determining the amount of bigeye tuna in the "yellowfin tuna" statistics. This sampling is comprehensive in that samples are taken from virtually every reefer that unloads Tema-based pole-and-line catches at U.S. canneries. Despite this effort, it is puzzling that the results do not agree with species composition statistics reported by ICCAT or show a consistent pattern when compared with the ICCAT statistics.

In west Africa, a fraction of the Tema-based pole-and-line catch enters the local market or is canned in Tema and is not exported to places like the U.S. This segment of the catch is thought to be primarily the undersized fish that are unacceptable for the

export trade of frozen tuna and are rejected. In addition, U.S. processors, who prefer larger fish, discourage the fishermen from landing undersized fish. Exact statistics on this catch are lacking, although part is believed to be accounted for in statistics available to ICCAT (ICCAT 1980; 1986a).

Most of the Tema-based pole-and-line catch is exported as frozen tuna. A large fraction is exported to the U.S., and a smaller amount to Europe, primarily Italy.

Informal reports on unloading activities in west Africa, indicate that the Ghanaian catch is often sorted into three components: small fish for local consumption and canning in Tema, medium-sized fish for export to the U.S. and large-sized fish for export to Europe. This procedure apparently was instituted beginning in the early 1980s.

We speculate that before 1981, a period when the operations of the Tema-based fleet were primarily supervised by foreign interests, virtually all catches were accounted for and reported to ICCAT and only minor amounts that entered the local market went unreported. The foreign interests at that time were very much aware that they were prohibited to sell, except under strict guidelines, tuna to the local market. Unauthorized sale would cause havoc with the local economy, be easily traced to the source and jeopardize the special status of foreign interests (Lawson and Kwei 1974). Since 1980, a new regime came into being as the 1979 fisheries law allowed Ghanaian interests to assume significant control over the fleet and with it the latitude to freely supply both the local and export markets. Collection of accurate catch statistics might have suffered because of this development.

Our results support this scenario. From 1976 to 1980 the difference in percentage of yellowfin tuna in the ICCAT statistics and NMFS sampling ranged from 1 to 12% in favor of the ICCAT statistics (Table 3). This bias is expected because only small amounts of bigeye were landed and there was no economic incentive for fishermen to separate the two species in their catch; catches of bigeye therefore were often included in reported statistics for yellowfin tuna. In Puerto Rico, the landings were systematically sampled, and bigeye tuna was separated from yellowfin tuna. The percentage of yellowfin tuna in the NMFS samples is consequently lower; hence, these percentages are probably more representative of the species mixture in the catch for those years.

Since 1980, there is no particular trend, although in three of the five years the percentage of yellowfin tuna in the ICCAT statistics is lower than in the NMFS samples (Table 3). As noted earlier, we suspect that this situation is related to the change in ownership and operational control of the fleet. It is further complicated by the significant unloadings in Abidjan since 1983, by ICCAT's minimum size limit for bigeye tuna which was adopted in 1980, and by the sorting of fish at the unloading ports. With

inconsistent reporting of fish sold on the local market or arbitrary reporting of undersized fish as one species or another, we would expect no trend in our results. Because we are not certain that this happened, however, we are not confident in specifying which source of species composition data since 1980 is more accurate. We recommend that other sources of data be examined to determine the accuracy of the ICCAT statistics and the circumstance surrounding this lack of consistency since 1980. In the meantime, the NMFS sampling program should continue until this investigation is completed and a procedure for adequate sampling of this fleet's landings is in place.

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Table 1 - Tonnage (1,000 mt) of tuna imported into the United States from Ghana and Ivory Coast.

Year	Ghana	Ivory Coast
1979	37.3	9.2
1980	27.3	11.7
1981	32.8	32.5
1982	25.2	25.3
1983	21.5	12.5
1984	6.0	28.1 ¹
1985	0	14.4 ¹

¹Beginning in 1984, transshipments were not separated by vessel registration but recorded by port of origin. These tonnages, therefore, include substantial catches from Tema-based pole-and-line vessels that were transshipped from Abidjan (see text).

Table 2 - Results of NMFS sampling for species composition of Tema-based pole-and-line vessel catches that are landed as "yellowfin tuna."

Year	Number of Samples	Number of Fish	Percent composition (in weight)			
			Yellowfin	Bigeye	Skipjack	Others
1976	84	5875	83.5	14.7	1.5	0.3
1977	49	3483	68.0	31.4	0.6	0
1978	38	4046	65.4	33.1	1.4	0.1
1979	62	6213	72.0	26.7	1.3	0
1980	38	3595	61.6	37.5	0.9	0
1981	21	1907	77.4	22.0	0.6	0
1982	18	1719	83.7	16.2	0.1	0
1983	18	1941	91.9	7.7	0.4	0
1984	18	1993	83.4	15.6	1.0	0
1985	12	1222	84.0	14.0	2.0	0

Table 3. Percentage of yellowfin and bigeye tuna in catches of Tema-based pole-and-line vessels from NMFS sampling and ICCAT statistics.

Year	NMFS ¹		ICCAT ²	
	Yellowfin	Bigeye	Yellowfin	Bigeye
1976	84	16	85	15
1977	68	32	73	27
1978	66	34	71	29
1979	72	28	84	16
1980	62	38	64	36
1981	78	22	71	29
1982	84	16	84	16
1983	92	8	95	5
1984	84	16	79	21
1985	85	15	76	24

¹Proportions from Table 2 were adjusted to equal 100%.

²Proportions are based on ICCAT catch statistics for Ghana, Japan and Korea-Panama.

Figure 1. Number of pole-and-line vessels fishing out of Tema, Ghana.

