

ACCURACY OF REPORTED CATCHES

BACKGROUND

Young yellowfin tuna, *Thunnus albacares*, and bigeye tuna, *T. obesus*, are quite similar in external appearance and difficult to tell apart (Miyake and Hayasi, 1972). In the Atlantic, both species are caught together in mixed schools as well as singly in unmixed schools. Young fish of both species (<125 cm) are almost exclusively caught in the surface fishery (Figure 1) and are often reported in landings as yellowfin tuna. This practice is particularly common with purse seiners because the amount of bigeye tuna is generally small compared to that of yellowfin tuna and the ex-vessel price is practically identical for small fish of both species. Also, no species distinction is made in canning of yellowfin and bigeye tunas; both are labeled light meat tuna. Consequently, there is no economic incentive for fishermen or fish brokers to routinely separate the catches of small fish by species.

In contrast, longline caught fish are larger and species distinction from external appearance is much easier. Ex-vessel prices for the large fish are quite different for each species, so catches are routinely sorted and recorded by species.

In 1972 the International Commission for the Conservation of Atlantic Tunas (ICCAT) recommended a minimum size regulation for yellowfin tuna. The regulation prohibits the taking and landing of yellowfin tuna weighing less than 3.2 kg (approximately 55 cm) and allows for incidental catches of small fish not exceeding 15% of the total number of yellowfin tuna landed on a per-vessel, per-landing basis. Member countries of ICCAT adopted this regulation, which went into effect on July 1, 1973. Since then, the reported catch of bigeye tuna for the surface fishery doubled (Figure 2), and incidences of undersized yellowfin tuna being landed as bigeye tuna were discovered. This discovery together with the fact that fishermen and buyers do not routinely separate catches of small bigeye tuna from small yellowfin tuna, cast suspicion on the accuracy of reported Atlantic catches of both species.

Studies to date have shown that the reported catches of Atlantic yellowfin and bigeye tunas are not accurate (Marcille, MS ¹/₁; Sakagawa, Coan, and Holzapfel, 1977; Tillerson, Coan, and Holzapfel, 1978), that separation of the two species from external appearance is difficult with small fish, particularly after they have been refrigerated (Fonteneau, 1976; Tillerson et al., 1978), and that much of the bigeye tuna caught by the surface fishery are small fish, less than 55 cm long (Bartoo and Sakagawa, 1978). In this report, we examine available data on the mixture of yellowfin tuna and bigeye tuna and develop adjusted catches to account for errors in species identification. Because comprehensive data on the misidentification of yellowfin and bigeye tunas in the catch statistics have only recently been collected, since about 1975, our study concentrated on statistics for 1976 for which reasonably complete data on the fisheries are currently available.

Catches of different fleets

Published catches from ICCAT were analyzed to determine if species compositions were consistent from one fleet to another for fleets that fished in identical area-time strata. Fonteneau (1976), using ICCAT catch statistics, showed that there is quite a difference in the ratio of bigeye tuna to yellowfin tuna in the United States catch as compared to that in the French-Ivory Coast-Senegalese (FIS) catch. For the period, August thru October 1974, the ratio was 0.16 for the U.S. purse seine fleet and 0.05 for the FIS purse seine fleet although both fleets operated in the same area off west Africa.

Similar comparisons were made with 1976 catches reported by 1° area-month to ICCAT. Reported landings by country were separated by gear, ICCAT yellowfin tuna area (ICCAT, 1977a) and quarter of the year. Available data limited the comparison to catches from ICCAT area 2 in 1976 for only a few fleets. The results clearly show that pole-and-line landings are significantly different in species composition from one fleet to another (Table 1). The Ghanaian pole-and-line fleet have a much higher ratio of bigeye tuna to yellowfin tuna than either the Japanese or Korean (Republic of Korea) pole-and-line fleets. This pattern was the same for all quarters of 1976.

Data for comparison of purse seine fleet landings are very limited. One comparison is shown in Table 1, in which none of the fleets reportedly caught bigeye tuna.

Discarding of catches of undersized (<3.2 kg) yellowfin tuna at sea might have affected the landing data. We believe, however, that the effect, if any, is small because the landings of these fleets have been predominately undersized fish and discarding at sea would have affected the catch of both species in direct proportion to their abundance in the catch.

We conclude from these results that either the mixture of fish available to the fleets fishing in similar areas and periods is different or the reported landings by species of the fleets are inaccurate.

Catches of the Tema-based pole-and-line fleet

The Atlantic pole-and-line fleets of Ghana, Japan, Korea, and Panama based in Tema, Ghana land their catches in Tema. Most of the fish, an estimated 70% in 1976, are exported to Puerto Rico for canning.

In mid-1975, the Southwest Fisheries Center, La Jolla Laboratory, initiated a project of collecting biological data on foreign-caught tunas imported into Puerto Rico (Sakagawa et al., 1977). The project has continued uninterrupted since 1975 with data collected so far for the entire years, 1976 and 1977.

Data on species composition and size frequency from about 41% in 1976 and 13% in 1977 of the imported landings of yellowfin and bigeye tunas of the Tema-based fleet were collected. The data indicate that 15% (by weight) of the combined yellowfin and bigeye tunas from the Tema-based fleet was bigeye tuna in 1976 and 28% (by weight) in 1977. The average percentage for the 2 years is 22%.

In contrast, ICCAT statistics (ICCAT, 1977b) for the Tema-based fleet show 64% of the combined yellowfin tuna and bigeye tuna landing was bigeye tuna in 1976 and 34% in 1977. These percentages are considerably higher than those recorded in Puerto Rico for the same fleet. It was suggested that this is caused by sorting of fish before the catch is shipped to Puerto Rico (ICCAT, 1977c). There has been unconfirmed reports that fish are occasionally sorted in Tema by size of fish and the small fish are not shipped to Puerto Rico. This sorting, however, could not have caused the large difference shown for 1976. Even if we allow for a higher percentage of bigeye tuna than yellowfin tuna in the fleet's catch (Figure 2), the difference is too large to be due to sorting and retention of small fish in Tema. Furthermore, it appears that whatever sorting for size that was done in Tema had no effect on the size distribution of fish landed in Puerto Rico; size samples collected in Tema and Puerto Rico are nearly identical (Figure 3).

Another source of landing statistics for the Tema-based fleet is cannery receipts in Puerto Rico. The canneries do not routinely separate the landings of small bigeye and yellowfin tunas but record the landing as yellowfin tuna. Sometimes, however, the species composition is estimated at the point of transshipment. The percentages of bigeye tuna in the yellowfin-bigeye landing from this source of statistics is identical to that computed from ICCAT statistics, i.e., 64% in 1976 and 34% in 1977.

We conclude from these results that the reported catch by species for yellowfin and bigeye tunas of the Tema-based pole-and-line fleet is not very accurate because of misidentification of species, and sampling in Puerto Rico appears to provide a representative species breakdown of the total landings despite possible retention of some landings in Tema.

Landings of FIS fleet in Abidjan

Sampling for species composition of the FIS purse seine catches landed in Abidjan was conducted in 1976 and 1977 by Marcille and Armada (MS²). Their sampling showed that 13% of the combined bigeye tuna and yellowfin tuna landings were bigeye tuna in 1976 and 18% in 1977. In contrast, the reported ICCAT catch of bigeye tuna for the FIS seine fleet in 1976 was 0.3% of the combined bigeye tuna and yellowfin tuna landing of that fleet. Fonteneau (1976) estimated that about 10% of the yellowfin tuna reportedly caught in 1974 by the FIS fleet from the entire eastern tropical Atlantic was actually bigeye tuna.

ADJUSTED CATCHES

The misidentification problem between yellowfin and bigeye tunas is confined to small fish that are caught primarily by the surface fishery. Other than the sampling in Puerto Rico of landings of the Tema-based fleet and in Abidjan of landings of the FIS seine fleet, there has not been any documented effort to collect comprehensive information on the actual species composition of the reported yellowfin tuna and bigeye tuna catches. In 1976, out of a total yellowfin tuna and bigeye tuna catch from the surface fishery of approximately 105,400 MT caught in various areas of the Atlantic (Table 2) only about 10% was actually sampled by experienced technicians for species composition. For the remainder, there has been no independent data on the species breakdown other than those reported by boat captains, brokers, processors and others who handle the catch at the ports of landing. If the results from the limited sampling in Puerto Rico and Abidjan are indicative of the overall reliability of catch statistics by species, there are serious inaccuracies in some reported catches.

Some adjustments to the surface fishery catches can be made, using the limited information obtained from sampling, to evaluate the extent of the inaccuracy in the overall statistics. We approached this by calculating a series of four estimates of total bigeye tuna and total yellowfin tuna catches for 1976 based on different assumptions (Table 3). For each case it is assumed that the longline catch, 20,900 MT of bigeye tuna and 23,500 MT of yellowfin tuna, is accurate as reported in ICCAT (1977b).

The first estimate is based on the assumption that 15% of the reported surface fishery catch of yellowfin and bigeye tunas in 1976 is bigeye tuna. In other words, the percentage of bigeye recorded for the Tema-based fleet, which accounted for 9% of the combined yellowfin tuna and bigeye tuna catches of the surface fishery that year is assumed to be applicable to the catch of the entire fishery. Using this assumption, we obtained an estimated catch of 89,600 MT of yellowfin tuna and 15,800 MT of bigeye tuna for the surface fishery. Adding the longline catches, we obtained 113,100 MT of yellowfin tuna and 36,700 MT of bigeye tuna for the entire Atlantic fishery.

The second estimate is based on the assumption that 10% of the combined yellowfin tuna and bigeye tuna catches of the FIS fleet is bigeye tuna and that 15% of the combined catches of all other fleets is bigeye tuna. These percentages are from the Tema-based fleet landings as measured in Puerto Rico in 1976, and from the FIS fleet, as estimated by Fonteneau for 1974 (1976). Our adjusted estimated catch is 92,000 MT of yellowfin tuna and 13,400 MT of bigeye tuna for the 1976 surface fishery.

A third estimate was calculated based on a series of assumptions: (1) the Spanish pole-and-line, U.S.A. purse seine and Canadian purse seine catches of bigeye tuna reported in ICCAT (1977b) are accurate because these fleets generally catch medium to large bigeye tuna; (2) adjusted bigeye tuna catches for the FIS pole-and-line and purse seine, Spanish purse seine and Moroccan purse seine fleets are correct as estimated by Marcille (MS¹); and (3) the bigeye tuna catch for all other fleets is 15% of the combined yellowfin and bigeye tuna catches. This percentage is based on the Puerto Rico sampling of the Tema-based pole-and-line fleet's catch. The computations are shown in Table 4. For this case, the estimated catch of bigeye tuna is 12,000 MT and of yellowfin tuna, 93,400 MT for the surface fishery and 32,900 of bigeye tuna and 116,900 MT of yellowfin tuna for the entire Atlantic fishery.

Finally a fourth estimate was made based on the assumption that misidentification occurs only with small fish, less than 125 cm long, and fish larger than 125 cm long are accurately identified. For this estimate, size compositions of the reported catches were estimated by gear, country, and species. Catches of fish larger than 125 cm long were considered to be accurately reported. Longline reported catches of yellowfin and bigeye tunas are assumed accurate as are baitboat catches of Spain and Portugal which are landed in the Canaries (Marcille MS²). Catches of bigeye tuna and of yellowfin tuna smaller than 125 cm were combined and a percentage applied to obtain the adjusted bigeye catch for small fish. The percentages used were 13% for all purse seine fleets (Marcille and Armada, MS²), and 15% for all other fleets. The estimated catch is 12,100 MT of bigeye tuna and 93,300 MT of yellowfin tuna (Table 5) for the surface fishery and 33,000 MT of bigeye tuna and 116,600 MT of yellowfin tuna for the entire Atlantic fishery.

In our judgement the best estimate is 12,100 MT of bigeye tuna and 93,300 MT of yellowfin tuna for the 1976 Atlantic surface fishery. These estimates are 5% lower for bigeye tuna and 1% higher for yellowfin tuna than reported in the ICCAT statistics (12,800 MT of bigeye tuna and 92,600 MT of yellowfin tuna).

COMPARISON WITH OTHER STUDIES

Marcille (MS¹) adjusted ICCAT statistics for 1964-77 for misidentification of bigeye tuna. He used data from the FIS fleet to adjust the catches of the FIS and Spanish fleets only. For 1976 he obtained an estimate of 17,900 MT of bigeye tuna for the surface fleet. His estimate is considerably greater (48%) than our best estimate of 12,100 MT. The difference is due primarily to our adjustment of the Tema-based fleet's catch whereas Marcille applied no adjustment.

NUMBER OF SMALL TUNA IN THE CATCH

Length-frequency samples from catches of Tema-based pole-and-line vessels, United States purse seiners and FIS purse seiners and pole-and-line vessels, were used to estimate the total number of bigeye and yellowfin tunas less than 3.2 kg caught by the surface fishery in 1976. For our best adjusted catches, the number of fish less than 32 kg is about 3.0 million bigeye tuna and about 4.6 million yellowfin tuna. In contrast, Marcille and Armada (MS³) estimated a catch of 2.8 million bigeye tuna and 2.0 million yellowfin tunas less than 3.2 kg caught in 1976.

Literature Cited

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- Tillerson, W.E., A.L. Coan, and E.P. Holzapfel. 1978. Sampling of imported Atlantic-caught tunas for size and species composition in Puerto Rico, U.S.A., 1976-1977. ICCAT Collective Vol. Sci. Pap., 7(SCRS-1977) (1): 142-145.

Footnotes

- ¹/Marcille, J. MS. Estimation du stock de patudo Atlantique a partir des modeles de production. ICCAT, SCRS/78/31. 4 pages, 2 Figures and 4 Tables.
- ²/Marcille, J., and N. Armada. MS. Estimation des prises et des structures de taille des patudos captures par la flotille F.I.S. ICCAT, SCRS/78/30. 5 pages, 5 Figures, 7 Tables and Annexes.
- ³/Marcille, J., and N. Armada. MS. Les prises de jeunes albacores et patudos dans L'Atlantique oriental tropical consequences en matiere d'amenagement. ICCAT, SCRS/78/32. 22 p.

Table 1. Comparison of bigeye tuna catch to yellowfin tuna catch for some pole-and-line and purse seine fleets that fished in ICCAT yellowfin tuna area 2 in 1976. Data source is ICCAT (1977a).

| Gear | Year/ Quarter | Fleet | Catch (MT) | | Ratio BE/YF |
|---------------|------------------|-------|-------------------|----------------|----------------|
| | | | Yellowfin (YF) | Bigeye (BE) | |
| Pole-and-line | 1976/1 | Japan | 190.7 | 716.4 | 3.8 |
| | | Ghana | 9.3 | 42.9 | 4.6 |
| | | Korea | 31.7 | 44.2 | 1.4 |
| | 1976/2 | Japan | 127.4 | 292.8 | 2.3 |
| | | Ghana | 0.6 | 14.5 | 24.2 |
| | | Korea | 27.2 | 37.2 | 1.4 |
| | 1976/3 | Japan | 475.0 | 402.8 | 0.8 |
| | | Ghana | 7.5 | 63.4 | 8.4 |
| | | Korea | 69.0 | 131.1 | 1.9 |
| | 1976/4 | Japan | 1006.0 | 1382.7 | 1.4 |
| | | Ghana | 8.3 | 95.2 | 11.5 |
| | | Korea | 109.4 | 195.7 | 1.8 |
| Purse seine | 1976/1 | Japan | 2.2 | 0 | 0 |
| | | Ghana | 34.0 | 0 | 0 |
| | | U.S. | 16.3 | 0 | 0 |

Table 3. Estimated catches of yellowfin and bigeye tunas for the 1976 Atlantic surface fishery. Catches adjusted for misidentification of species.

| Estimates ^{1/} | Catch (metric tons) | | | Source |
|-------------------------|---------------------|--------|---------|--|
| | Yellowfin | Bigeye | Total | |
| ICCAT | 92,600 | 12,800 | 105,400 | ICCAT (1977b) |
| Estimate 1 | 89,600 | 15,800 | 105,400 | 15% bigeye tuna |
| Estimate 2 | 92,000 | 13,400 | 105,400 | 15% bigeye tuna for all fleet, except the FIS fleet, 10% |
| Estimate 3 | 93,400 | 12,000 | 105,400 | See Table 4 |
| Estimate 4 | 93,300 | 12,100 | 105,400 | See Table 5 |

^{1/} See text for estimation procedures.

Table 2. Eastern Atlantic surface catches (metric tons) of yellowfin (YF) and bigeye (BE) tunas by ICCAT surface areas, 1976.

| Country | | ICCAT yellowfin tuna surface areas | | | | | Unknown | Total |
|----------|----|------------------------------------|--------|-------|-------|-------|---------|--------|
| | | I | II | III | IV | V | | |
| Angola | YF | - | - | - | - | - | 1,005 | 1,005 |
| | BE | - | - | - | - | - | - | - |
| FIS | YF | 22,054 | 12,935 | 4,895 | - | 8,105 | - | 47,989 |
| | BE | - | - | - | - | - | 1,030 | 1,030 |
| Ghana | YF | - | 451 | - | - | - | - | 451 |
| | BE | - | 664 | - | - | - | - | 664 |
| Japan | YF | 254 | 1,971 | - | - | - | - | 2,225 |
| | BE | 530 | 3,058 | - | - | - | - | 3,588 |
| Korea | YF | 2 | 395 | - | - | 4 | - | 365 |
| | BE | 2 | 808 | - | - | - | - | 810 |
| Morocco | YF | - | - | - | - | - | 1,656 | 1,656 |
| | BE | - | - | - | - | - | - | - |
| Cuba | YF | - | - | - | - | - | 600 | 600 |
| | BE | - | - | - | - | - | - | - |
| Panama | YF | - | - | - | - | - | 363 | 363 |
| | BE | - | - | - | - | - | 849 | 849 |
| Portugal | YF | - | - | - | 313 | - | - | 313 |
| | BE | - | - | - | 1,598 | - | - | 1,598 |
| Spain | YF | - | - | - | 228 | - | 34,945 | 35,173 |
| | BE | - | - | - | 4,225 | - | 1,515 | 5,740 |
| U.S.A. | YF | 392 | 1,260 | - | - | 54 | - | 1,706 |
| | BE | - | 28 | - | - | - | - | 28 |

Table 4. Adjusted catches (metric tons) and reported ICCAT catches (metric tons) of yellowfin and bigeye tunas for the 1976 Atlantic fisheries. Adjustments were based on species composition information.

| | ICCAT (1977b) | | | Estimates | | | Comment |
|----------------------|---------------|--------|---------|-----------|--------|---------|--|
| | Yellowfin | Bigeye | Total | Yellowfin | Bigeye | Total | |
| <u>Longline</u> | | | | | | | |
| Argentina | 57 | 176 | 233 | 57 | 176 | 233 | } Large fish are landed. Reported catches are considered accurate. |
| Brazil | 578 | 161 | 739 | 578 | 161 | 739 | |
| Cuba | 3,000 | 1,300 | 4,300 | 3,000 | 1,300 | 4,300 | |
| Japan | 3,366 | 7,297 | 10,663 | 3,366 | 7,297 | 10,663 | |
| Korea | 11,211 | 6,747 | 17,958 | 11,211 | 6,747 | 17,958 | |
| Panama | 2,924 | 1,883 | 4,807 | 2,924 | 1,883 | 4,807 | |
| Taiwan | 1,736 | 3,274 | 5,010 | 1,736 | 3,274 | 5,010 | |
| Venezuela | 626 | 21 | 647 | 626 | 21 | 647 | |
| Total | 23,498 | 20,859 | 44,357 | 23,498 | 20,859 | 44,357 | |
| <u>Pole-and-line</u> | | | | | | | |
| Angola | 1,005 | 0 | 1,005 | 850 | 150 | 1,000 | } 15% of total ² From Marcille (MS) ¹ |
| FIS | 3,960 | 882 | 4,842 | 3,890 | 950 | 4,840 | |
| Ghana | 297 | 634 | 931 | 790 | 140 | 930 | } 15% of total ² Reported catch accurate. |
| Japan | 2,225 | 3,588 | 5,813 | 4,940 | 870 | 5,810 | |
| Korea | 365 | 810 | 1,175 | 1,000 | 180 | 1,180 | |
| Panama | 363 | 849 | 1,212 | 1,030 | 180 | 1,210 | |
| Portugal | 313 | 1,598 | 1,911 | 1,620 | 290 | 1,910 | |
| Spain | 228 | 4,225 | 4,453 | 228 | 4,225 | 4,453 | |
| Total | 8,756 | 12,586 | 21,342 | 14,348 | 6,985 | 21,333 | |
| <u>Purse seine</u> | | | | | | | |
| Canada | 161 | 23 | 184 | 161 | 23 | 184 | } Reported catch accurate. 15% of total ² |
| Cuba | 600 | 0 | 600 | 510 | 90 | 600 | |
| FIS | 44,029 | 148 | 44,177 | 41,770 | 2,410 | 44,180 | } From Marcille (MS) ¹ 15% of total ² |
| Ghana | 154 | 30 | 184 | 150 | 30 | 180 | |
| Morocco | 1,656 | 0 | 1,656 | 1,570 | 90 | 1,660 | } From Marcille (MS) ¹ From Marcille (MS) ¹ |
| Spain | 34,945 | 0 | 34,945 | 32,600 | 2,300 | 34,900 | |
| U.S.A. | 2,295 | 28 | 2,323 | 2,295 | 28 | 2,323 | } Reported catch accurate. |
| Total | 83,840 | 229 | 84,069 | 79,056 | 4,971 | 84,027 | |
| <u>Unclass</u> | 289 | 2,173 | 2,462 | 2,090 | 370 | 2,460 | 15% of total ² |
| Grand Total | 116,383 | 35,848 | 152,230 | 118,992 | 33,485 | 152,177 | |

¹J. Marcille. MS. Estimation due stock de patudo Atlantique a partir des modeles de production. ICCAT, SCRS/78/31.

²Estimate of 15% based on sampling of Tema-based fleet catch in Puerto Rico.

Table 5. Adjusted catches (metric tons) of yellowfin and bigeye tunas for the 1976 Atlantic fisheries. Adjustments were based on species composition and size composition information. 125 cm is the dividing point between large and small categories.

| Country | Yellowfin | | Bigeye | | Total Small | Estimated Small ¹ | | Estimated Total | |
|----------------------|---------------|---------------|--------------|---------------|----------------|------------------------------|--------------|-----------------|---------------|
| | Small | Large | Small | Large | | Yellowfin | Bigeye | Yellowfin | Bigeye |
| Longline | | | | | | | | | |
| Argentina | | 57 | | 176 | | | | 57 | 176 |
| Brazil | | 578 | | 161 | | | | 578 | 161 |
| Cuba | 3,000 | | 1,300 | | | | | 3,000 | 1,300 |
| Japan | 3,366 | | 7,297 | | | | | 3,366 | 7,297 |
| Korea | 11,211 | | 6,747 | | | | | 11,211 | 6,747 |
| Panama | 2,924 | | 1,883 | | | | | 2,924 | 1,883 |
| Taiwan | 1,736 | | 3,274 | | | | | 1,736 | 3,274 |
| Venezuela | | 626 | | 21 | | | | 626 | 21 |
| Total | | 23,498 | | 20,859 | | | | 23,498 | 20,859 |
| Pole-and-Line | | | | | | | | | |
| Angola | 996 | 9 | 0 | 0 | 996 | 847 | 149 | 856 | 149 |
| FIS | 3,924 | 36 | 803 | 79 | 4,727 | 4,018 | 709 | 4,054 | 788 |
| Ghana | 297 | 0 | 634 | 0 | 931 | 791 | 140 | 791 | 140 |
| Japan | 2,225 | 0 | 3,588 | 0 | 5,813 | 4,941 | 872 | 4,941 | 872 |
| Korea | 365 | 0 | 810 | 0 | 1,175 | 999 | 176 | 999 | 176 |
| Panama | 363 | 0 | 849 | 0 | 1,212 | 1,030 | 182 | 1,030 | 182 |
| Portugal | 0 | 313 | 0 | 1,598 | 0 | 0 | 0 | 313 | 1,598 |
| Spain | 0 | 228 | 0 | 4,225 | 0 | 0 | 0 | 228 | 4,225 |
| Total | 8,170 | 586 | 6,684 | 5,902 | 14,854 | 12,626 | 2,228 | 13,212 | 8,130 |
| Purse Seine | | | | | | | | | |
| Canada | 109 | 52 | 23 | 0 | 132 | 115 | 17 | 167 | 17 |
| Cuba | 159 | 441 | 0 | 0 | 159 | 138 | 21 | 579 | 21 |
| FIS | 12,518 | 31,511 | 144 | 4 | 12,662 | 11,016 | 1,646 | 42,527 | 1,650 |
| Ghana | 67 | 87 | 29 | 1 | 96 | 84 | 12 | 171 | 13 |
| Morocco | 719 | 937 | 0 | 0 | 719 | 626 | 93 | 1,563 | 93 |
| Spain | 15,166 | 19,779 | 0 | 0 | 15,166 | 13,194 | 1,972 | 32,973 | 1,972 |
| U.S.A. | 1,522 | 743 | 28 | 0 | 1,580 | 1,375 | 205 | 2,118 | 205 |
| Total | 30,290 | 53,550 | 224 | 5 | 30,514 | 26,549 | 3,966 | 80,098 | 3,971 |
| Unclass | | 289 | | 2,173 | | | | 289 | 2,173 |
| Grand Total | 38,460 | 77,923 | 6,908 | 28,939 | 30,514 | 39,174 | 6,194 | 117,097 | 35,133 |

¹Based on 15% bigeye in combined small yellowfin and bigeye for all baitboats, 13% bigeye in combined small yellowfin and bigeye for all purse seines.

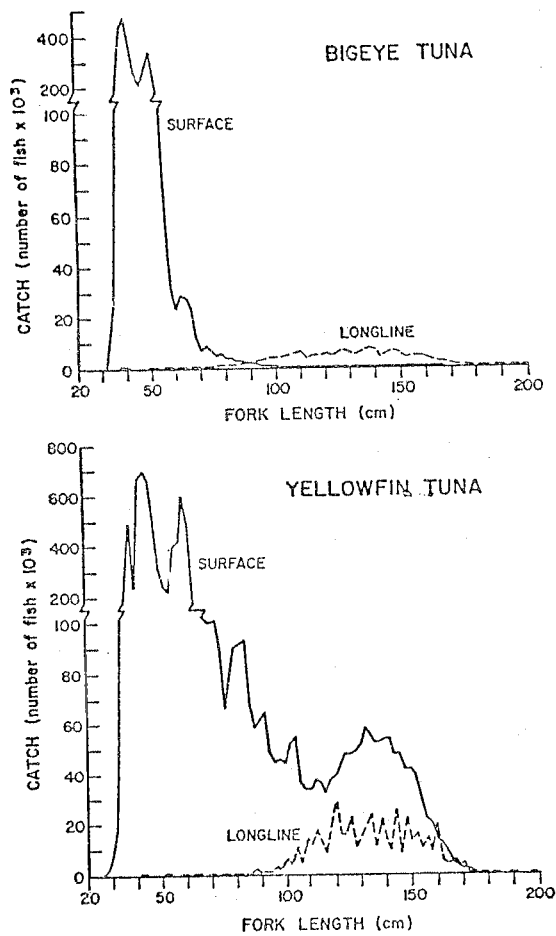


Figure 1. Length compositions of the catches (number of fish) of bigeye and yellowfin tunas from the Atlantic Ocean caught by surface (baitboat and purse seiners) and longline gears in 1976.

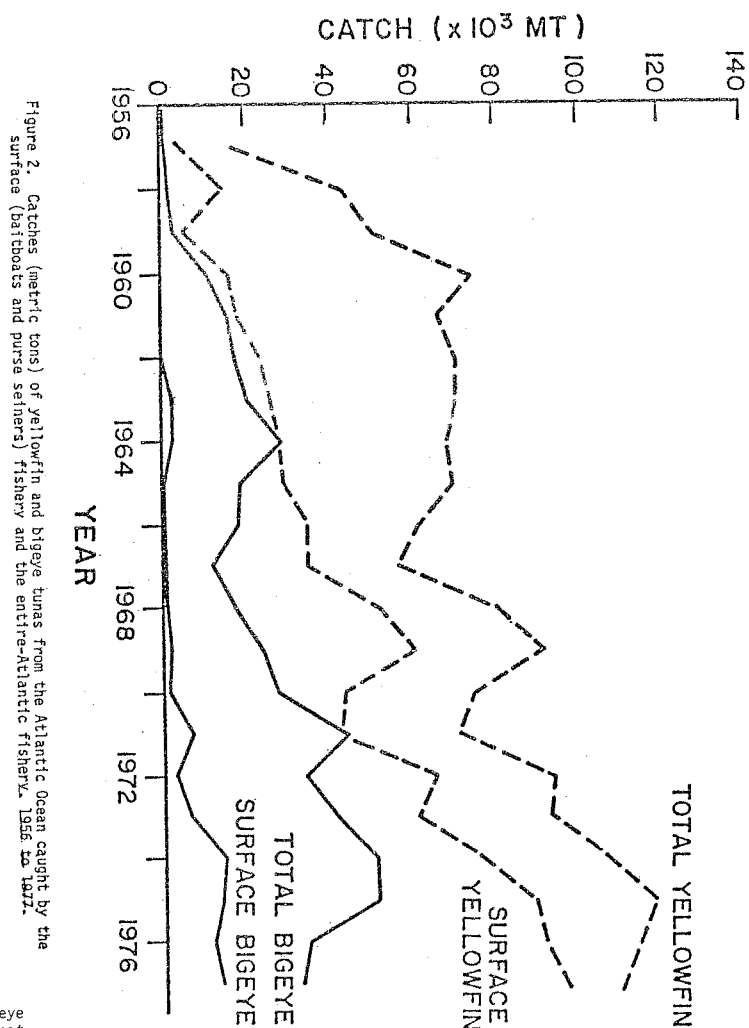


Figure 2. Catches (metric tons) of yellowfin and bigeye tunas from the Atlantic Ocean caught by the surface (baitboats and purse seiners) fishery and the entire-Atlantic fishery, 1956 to 1976.

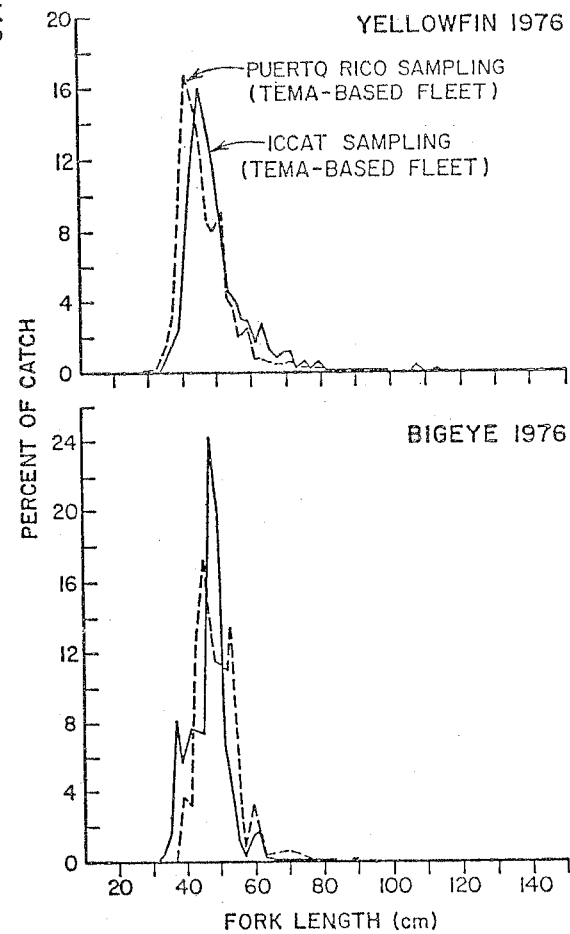


Figure 3. Length compositions of the catches (percent) of yellowfin and bigeye tunas from the Atlantic Ocean caught by the Tema-based fleet in 1976 and sampled by ICCAT at Tema, Ghana or sampled by National Marine Fisheries Service personnel in Puerto Rico.