

THE BAITBOAT FISHERY FOR SKIPJACK TUNA IN THE GULF OF GUINEA. REVIEW AND UPDATE, WITH COMMENTS ON CATCH AND EFFORT DATA

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SUMMARY

The history of the baitboat fishery for skipjack in the Gulf of Guinea and of catch/effort sampling are briefly reviewed. Summaries of catches, number of vessels and catch per unit effort through 1984 are presented. The lack of correspondence between catch/effort data at fine levels is discussed, as are problems with catch/effort sampling since 1981.

RESUME

Le présent document contient un bref exposé de la pêche de listao à l'appât vivant dans le golfe de Guinée, et l'échantillonnage prise/effort de cette pêcherie. Une récapitulation des prises, du nombre de bateaux et de la prise par unité d'effort est présentée jusqu'à 1984 compris. Le manque de concordance entre les données de prise/effort aux niveaux plus affinés est mentionné, ainsi que les problèmes qui concernent l'échantillonnage de prise/effort depuis 1981.

RESUMEN

Se hace un breve examen de la historia de la pesquería de listado con barcos de cebo vivo en el Golfo de Guinea, así como el muestreo de su captura/esfuerzo. Se presenta un resumen de las capturas, número de barcos y captura por unidad de esfuerzo, hasta finales de 1984. Se trata sobre la falta de correlación existente entre los datos de captura/esfuerzo a niveles finos, y también sobre los problemas del muestreo de captura/esfuerzo desde el año 1981.

The baitboat fishery off west Africa has a relatively long history. In the early 1950s French fishermen operated from Dakar in Senegal for part of the year, and there were indigenous baitboat fisheries in Angola and the Cape Verde Islands. Not long after, Spanish boatboats joined the fishery. By the mid-1960s there were French and Japanese baitboats fishing from Pointe-Noire in the Congo, and Japanese baitboats were based in Tema, Ghana. The Pointe-Noire fishery was later phased out. In the mid-1970s the Japanese baitboats at Tema were joined by Korean boats, some flying Panamanian or other flags of convenience. Ghanaian baitboats began fishing in the early 1970s. In recent years the Tema-based fleet has been the principal boatboat fleet in the eastern Atlantic.

Most fishing by the Tema-based fleets has been confined to a relatively small area in the Gulf of Guinea, north of the Equator and east of 5 degrees West. Skipjack tuna (*Katsuwonus pelamis*) was a minor part of the catch in the early years because of market considerations, but for the last 15 years or so the species has dominated Atlantic baitboat landings.

The total catch of skipjack by Tema-based baitboats has been relatively constant for the past decade. It attained a level of about 20,000 tons/year in 1974, and has since usually been in the range of 25,000-30,000 tons/year (Table 1). Since 1973 it has accounted for at least 20-30 percent of the eastern Atlantic skipjack catch by surface gear. Most of the catches are transhipped, a large part to canneries in Puerto Rico.

The precise number of baitboats based in Tema is a somewhat elusive statistic. Various estimates have been published (Table 2). Although the estimates do not agree, in most years they are within plus or minus ten percent of one another (1975-76 and 1981 are the exceptions). Carrying capacity estimates given by Miyake (1984) agree closely with the country estimates shown in the table. All estimates agree that the number of boats reached 30-40 by 1973, increased in 1978-79, then returned to the 30-40 level. The fleet presently comprises about 30 boats.

While the number of vessels has been fairly stable for several years, the distribution of their registration has changed. The number of Japanese boats peaked in 1973-75, and has since decreased steadily. The number of Korean (including Panamanian) baitboats peaked in 1978, then decreased. The number of Ghanaian boats has increased from less than 20 percent before 1980 to nearly the whole fleet in 1984. Most if not all of the Ghanaian vessels have been bought from Japanese or Korean interests and have changed registration without leaving Tema.

Catch/effort data

The Japanese government initiated collection of catch/effort data for its Atlantic baitboats in 1969. Ghana started collecting similar data for its own fleet and for the Japanese and Korean fleets in 1973-74. Korea began collecting catch and effort data from its fleet in 1976.

Early catch/effort data must be used with some caution. Kume (1980) noted that the 1969-78 effort data collected by the Japanese government was in terms of successful fishing days. The ICCAT Standing Committee on Research and Statistics (SCRS) recommended that the data be revised so that the effort unit would be equivalent to fishing days. Kume re-estimated the effort as fishing days for 1969-78 on an annual basis. The data in the ICCAT Task 11 data bank have not been adjusted. Wise (1986a) suggested on the basis of Kume's figures that the 1969-78 Japanese baitboat fishing effort and cpue should be reduced by 15 percent when comparing the older Japanese data with data from other fleets and with Japanese data from 1979 on. Korean government catch/effort data for its fleet before 1978 are not for one-degree squares and/or not in terms of days fishing. The Korean data are appropriately coded in the data bank.

A summary of catch/effort data for the Tema-based fleets from 1969 to 1984 is presented in Table 3. Examination of the table shows several interesting phenomena:

1. All five series, collected from three components of the fleet by three different governments, show similar overall trends.
2. All five series show very closely related tendencies during the six years 1978-83 when it is possible to compare cpue data from the five sampling systems. For example, the cpue estimates for 1979 are higher than those for 1978 and 1980 in all of the series. The cpue estimates for 1981 are higher than those for 1980 and 1982 in all of the series. The 1983 estimates are higher than those for 1982 in four of the five series.
3. There is a statistically significant increasing trend for the skipjack since 1975 in nearly all of the series.
4. While the cpue's of all of the series have increased since 1975, the "trend" may in fact be a statistical artifact. None of the series shows any significant trend from 1978 through 1983, but the plateau in 1978-83 is clearly higher than the pre-1978 level in all cases. And the 1984 cpue estimates from the Japanese and Korean government data are very high.
5. The series show systematic differences in levels of cpue. For instance, cpue estimates from the Japanese government data are always higher than estimates of Ghanaian baitboat cpue. There are systematic differences in data collected from the same fleet by different agencies. Korean government cpue figures are always higher than similar data collected from Korean baitboats by Ghana. Japanese government cpue is almost always higher than that for Japanese baitboats collected by Ghana. For this reason, it is possible that the differences in levels may be due to biases in data collection rather than differences in efficiency between fleets.

It is interesting to speculate on the reasons for the increase in skipjack tuna cpue since 1975 for Tema-based baitboats. One explanation is that it represents a true increase in the abundance of skipjack tuna in the area fished. This increase in abundance could be related to the well documented decrease in abundance of the heavily fished yellowfin tuna (*Thunnus albacares*) in the same period. Perhaps the skipjack are occupying the ecological niche left partially vacant by the yellowfin? This hypothesis can be tested if the yellowfin abundance increases as expected with the marked reduction in fishing effort for and catches of yellowfin following 1983.

Wise (1983) examined the relationships between various series at the one-degree square/month level. The analysis was done on pooled 1978-80 data. Correlations significant at $p = .01$ were found in most cases. Correlation coefficients increased when one-degree squares with less than five days fishing were eliminated (Table 4). Although the correlations were highly significant, the coefficients of determination were always below .20. That is, the cpue figure for a one-degree square for one series was not a good predictor of the cpue of another series in the same square.

I examined the correlations in a similar fashion for the years 1981-84. Correlations significant at $p = .05$ or better are found in most cases for 1981 and 1982 data when all data are included, but the coefficients of determination are usually below .20, confirming that the cpue for a small area for one series is not a useful predictor of cpue for another series in the same small area (Table 4).

When squares with less than five days fishing are eliminated, the correlations for 1981 improve as they did for the 1978-80 pooled data. They do not improve for the 1982 data, probably because of the low numbers of squares in which comparisons could be made. The number of one-degree squares that can be compared decreases sharply in 1983 and 1984, and no correlations significant even at the $p = .05$ level are found for 1983 and 1984.

The reasons for the changes after 1981 become clear when the data are examined year by year. In 1981 the Japanese and Korean government sampling for catch/effort was at a level of 70 percent or higher, while Ghanaian sampling was at about 30 percent. Japanese and Korean government sampling continued at at least 70 percent in 1982. Ghanaian sampling of the foreign fleets was at a rate of less than 20 percent, and of its own fleet at about 10 percent. Skipjack were combined with other species as "young tunas" in some catch/effort samples collected by Ghana.

Japanese and Korean government sampling continued at about the same levels in 1983, but Ghanaian sampling of the foreign fleets was at 10 percent or lower. There was no sampling of the foreign fleets for several months, and skipjack were frequently combined with other species as "young tunas." Ghana's sampling of its own fleet was at a rate of about two percent.

The Japanese fishery terminated at the end of March in 1984. Japanese and Korean government sampling of their own fleets in 1984 was close to 100 percent.

Low levels of catch/effort for skipjack sampling by Ghana are not the only examples of less than optimum sampling of this fishery. Although the Japanese and Korean government catch/effort sampling of skipjack has been at relatively high levels, Japanese sampling of bigeye tuna and Korean sampling of yellowfin and bigeye tuna has been low in recent years. Attention was called to recent low levels of catch/effort sampling in these and other series in a report presented at the 1985 SCRS meeting (Wise, 1986b).

In 1984 the Tema-based fleet, which had in recent years landed some of its catches at Abidjan in the Côte d'Ivoire (Ivory Coast), some 270 nautical miles to the west of Tema, began landing nearly all of its catches in Abidjan. Personnel from the Centre de Recherches Océanographiques have been sampling the landings for catch/effort and size under an agreement with the Ghanaian authorities.

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Table 1 - Catches of skipjack tuna by Tema-based baitboats, 1970-84

Year	Japan	Korea	Panama	Ghana	Total
	metric tons				
1970	7,481	0	0	0	7,481
1971	11,730	0	0	0	11,730
1972	10,149	0	676	0	10,825
1973	12,980	922	159	128	14,189
1974	18,672	2,123	979	701	22,475
1975	3,664	4,469	1,854	1,252	11,239
1976	15,042	1,948	2,467	2,103	21,560
1977	16,845	3,600	3,970	3,492	27,907
1978	14,614	8,132	2,980	2,636	28,362
1979	14,686	12,017	1,750	4,007	32,460
1980	12,304	6,718	1,735	4,720	25,477
1981	12,935	7,538	144	4,945	25,562
1982	8,520	2,827	2,514	14,520	28,381
1983	4,562	1,553	1,611	20,540	28,266
1984*	442	846	0	17,752	19,040

*preliminary

Sources: ICCAT Statistical Bulletin, Volume 15 and preceding volumes.

Table 2 - Estimates of numbers of baitboats based at Tema by nationality, 1970-84

Year	Japan	Kor+Pan	Ghana	Total(1)	Total(2)	Total(3)
1970	6	0	0	6	6	-
1971	8	0	0	8	8	-
1972	14	2	0	16	16	-
1973	22	7	2	31	31	-
1974	24	13	4	41	28	-
1975	24	11	4	39	31	-
1976	15	12	4	31	30	41
1977	18	19	5	42	40	41
1978	19	23	6	48	46	46
1979	15	20	8	43	46	46
1980	12	13	10	35	39	39
1981	10	7	18	35	38	44
1982	7	7	24	38	-	44
1983	4	4	28	36	-	-
1984	2	1	27	30	-	-

Notes:

- Country numbers and Total(1) from Fishing Power Tables, ICCAT Statistical Bulletin, Volume 15 and preceding volumes
- Total(2) from Wise (1986a)
- Total(3) from Mensah & Kwei (1986)
- Japanese baitboats fishing from South American ports are not included, but some Panamanian boats that fished in the western Atlantic in 1978-80 are included in Kor+Pan

Table 3 - Skipjack tuna CPUE for Tema-based baitboats, 1969-84

Year	Ghana	Japan	Japan(mod)	Korea	Jap.ICAT	Kor+Pan
	metric tons/day					
1969	-	4.2	3.6	-	-	-
1970	-	6.0	5.1	-	-	-
1971	-	6.9	5.9	-	-	-
1972	-	5.9	5.0	-	-	-
1973	-	4.2	3.6	-	3.1	-
1974	2.5	4.9	4.2	-	3.9	2.4
1975	2.3	4.8	4.1	-	2.1	2.9
1976	3.2	5.3	4.5	-	2.9	2.8
1977	4.3	5.5	4.7	-	3.8	2.7
1978	3.5	6.4	5.4	3.6	4.1	3.4
1979	4.2	7.1	-	6.7	7.3	5.3
1980	3.4	6.3	-	4.0	5.6	3.7
1981	5.1	6.9	-	7.0	7.4	6.7
1982	3.6	6.5	-	6.3	4.7	3.4
1983	4.1	6.3	-	7.7	4.9	4.4
1984	-	7.6	-	12.7	-	-

Notes:

- Japan(mod) is reduced by 15 percent as described in the text
- Jap.ICAT and Kor+Pan are from data collected by Ghana on the foreign fleets
- Figures for Ghana through 1981, Japan and Korea through 1982, and Jap.ICAT and Kor+Pan through 1981 are from Wise (1986a)
- More recent cpue's are total annual catch/total annual effort from the ICCAT Task II data bank

Table 4 - Comparisons of skipjack tuna cpue by month/squares between various data series, Tema-based baitboats, 1978-84. Coefficients of correlation and determination and numbers of observations.

	All data				
	1978-1980	1981	1982	1983	1984
Japan vs. Korea	.181**(399)	.110 (167)	.238* (83)	-.140(32)	.773(5)
r2	.033	.012	.057	.020	.598
Japan vs. Ghana	.289 (36)	.244* (89)	.344**(69)	.242(52)	-
r2	.084	.060	.118	.059	-
Japan vs. Jap.ICAT	.347**(110)	.594**(145)	.244* (80)	.293(16)	-
r2	.120	.353	.060	.086	-
Korea vs. Kor+Pan	.312**(119)	.422**(104)	.698**(27)	.569 (5)	-
r2	.097	.178	.487	.324	-

Squares with less than 5 days excluded

	1978-1980	1981	1982	1983	1984
Japan vs. Korea	.298**(112)	-.622** (22)	-.139 (6)	.222 (7)	-(0)
r2	.089	.387	.019	.049	-
Japan vs. Ghana	.366 (27)	.716** (17)	.340 (7)	- (1)	-
r2	.134	.513	.116	-	-
Japan vs. Jap.ICAT	.394** (88)	.610** (40)	-.469 (5)	- (2)	-
r2	.155	.372	.220	-	-
Korea vs. Kor+Pan	.399** (57)	.623 (5)	- (1)	- (2)	-
r2	.159	.388	-	-	-

Notes:

- *significant at p = .05
- **significant at p = .01
- (00) is number of pairs of observations
- r2 is coefficient of determination
- Squares with "young tuna" excluded in 1982 and 1983
- 1978-80 from Wise (1983)