# OVERALL FISHING INTENSITY, CATCH, CATCH BY SIZE AND SPAWNING INDICES OF YELLOWFIN TUNA IN THE ATLANTIC TUNA LONGLINE FISHERY, 1956-76

by

M. Honma

## SUMMARY

This report updates the former six series on catch and effort statistics of yellowfin tuna taken by the whole Atlantic longline fishery and catch by size class and spawning indices estimated from Japanese longline data.

Total yellowfin catches in 1976 by longline fishery from the Atlantic was 24,000 MT (1.04 million fish), 5,600 MT of decline compared with the previous year. The Japanese and Taiwanese catches have been decreasing in recent years and the catches by these two countries to the total longline catches now form only 14 and 7%, respectively.

Fishing intensity of the whole longline fishery also has decreased since 1973 and it was 1.113 million hooks (effective hooks/5° sq) in 1976. As total catches of yellowfin tuna increased by 9,000 fish more than the previous year, hook rates increased to 056% in 1976.

Increases of smaller fish in catches of Caribbean area estimated by the Japanese longline data appear to explain partially the decrease of 5,600 MT of catch in 1976. Spawning indices showed slight decrease in 1976 but remained in the recent low levels.

## RESUME

Ce rapport met à jour les six séries qui avaient été précédemment établies, pour les statistiques de capture et effort correspondant aux prises d'albacore par l'ensemble de la pêcherie palangrière atlantique, et pour la capture par classe de taille et les indices de ponte estimés à partir des données palangrières japonaises.

Les captures palangrières d'albacore atlantique en 1976 se sont élevées à 24 milliers de tonnes (1,04 millions de poissons), 5,6 milliers de tonnes de moins que l'année précédente. Les prises japonaises et taiwanaises ont baissé ces dernières années, et ne représentent plus que 14 % et 7 %, respectivement, de la capture palangrière totale.

L'effort de pêche de la pêcherie palangrière dans son ensemble a également baissé depuis 1973, et a été en 1976 de 1,113 millions d'hamecons (hameçons effectifs par carré de 5º x 5º). De même que la capture totale d'albacore dépassait de 9.000 poissons celle de l'année précédente, le taux par hameçon a augmenté en 1976 de 0,56 %.

La présence accrue de petits poissons dans les prises de la zone des Caraïbes, estimée à partir des données palangrières japonaises, semble expliquer en partie la baisse de 5,6 milliers de tonnes en 1976. La même année, les indices de ponte ont montré une légère baisse, tout en restant au niveau faible des années récentes.

## RESUMEN

Se actualizan las seis precedentes series de estadísticas de captura y esfuerzo referentes al rabil capturado por el conjunto de la pesquería de palangre, así como la captura por clase de talla y los índices de desove estimados en base a los datos japoneses de palangre.

El total de captura palangrera de rabil en el Atlántico en 1976 fue de 24.000 toneladas (1,04 millones de peces) 5,6 toneladas menos que en el año anterior. Las capturas de Japón y Taiwan han disminuido en los últimos años y la contribución de estos dos países al total de la captura de palangre es actualmente sólo del 14 % y el 7% respectivamente. Asimismo, desde 1973 ha disminuido la intensidad de pesca del conjunto de la pesquería de palangre que fue de 1,113 millones de anzuelos (anzuelos efectivos /cuad. 5º) en 1976. Ese año la captura total de rabil aumentó en 9.000 peces con respecto al año anterior y las tasas de anzuelos en un 0,56 %.

Un mayor número de peces pequeños en las capturas de la zona del Caribe -según una estimación realizada partiendo de datos palangreros japoneses- explicaría en parte el descenso en 5,6 miles de toneladas experimentado en la captura de 1976. Los índices de desove fueron ligeramente inferiores ese año, si bien permanecieron dentro de los bajos niveles recientes.

In this report, the seventh series covering data up to 1976, compiled are fishing intensity, catch in weight (referred to "yield"), catch in number (referred to "catch") by size and spawning indices on yellowfin tuna taken by Japanese and other longline fishing countries in the Atlantic Ocean.

1. Material and method

Yield and catch statistics were obtained from the ICCAT Statistical Bulletin (ICCAT 1975-1977) and the Annual Report of Effort and Catch Statistics by Area on Japanese Tuna Longline Fishery (Fisheries Agency of Japan 1965-1978, Shiohama et al. 1965). Catch and effort statistics by area of Taiwanese longline fishery were also used (Institute of Oceanography, National Taiwan University 1973, 1974, 1975a, 1975b, ICCAT personal communication for the 1975 and 1976 statistics). As the Taiwanese longline data by area are the sample statistics, total expanded number of hooks and catches were estimated raising reciprocals of coverage rates.

Length data collected through on-board measurments by the Japanese fishermen and compiled by the Far Seas Fisheries Research Laboratory were utilized.

For "average year" which is defined in the process of calculating the fishing intensity (Honma 1973), the same period 1965-1975 as in the sixth series was chosen and only the Japanese data were used for the calculation of average year pattern of yellowfin distribution in terms of hook rates. Method of estimation of the total fishing intensity and catch by the entire Atlantic longline fleets is described in the sixth series (Honma and Suzuki 1978).

The yield and catch of yellowfin tuna from the Japanese Atlantic longline fleet have now decreased to a very minor level as is mentioned later. The estimation of the total fishing intensity and catch on the basis of the Japanese data, therefore, might cause a significant bias. Necessity and responsibility of the longline fishing contries to improve and make public their detailed catch and effort statistics by area should be recognized.

2. Yield and catch

Annual yield of yellowfin tuna by the entire longline fleets in the Atlantic has leveled off since 1966, fluctuating between 21 and 33 thousand tons (Fig. 1). The 1976 yield was 24 thousand tons, 5.6 thousand tons decline to the previous year. The Japanese yield in 1976 was 3,360 tons, the lowest record, which accounted only 14 % to the total. The situation is similar with the Taiwanese fleet with which its share was 1,736 tons or 7 % to the total. In contrast to the decline of the yield by the Japanese and Taiwanese fleets, Korean, Panamanian, and Cuban longline fishery increased or maintained their yield and yield by Korean fleet forms about a half of the entire longline yield (Fig. 1).

Estimated Japanese catch of yellowfin tuna were about 104 thousand in 1976 with hook rates of 0.56 % which remained roughly the same low level as in the recent years after 1970 (Table 1).

3. Fishing intensity

Fishing intensity of the Japanese longline fleet as well as the Taiwanese longline fleet on yellowfin tuna (effective hooks/5°sq.) is on decrease in the recent years and in 1976, it was about 152 thousand hooks, 88 thousand hooks less than that in the previous year for the Japanese fleet and 86 thousand hooks for the Taiwanese fleet (Table 1). The decrease in fishing intensity shows disinterest of the longline fleets of the two countries toward yellowfin stocks and is reflected in the trend of indices of effectiveness (number of effective hooks/nominal number of hooks) (Fig. 2). The fishing intensity of the entire longline fleets increased remarkably after 1970, peaked in 1973 and has decreased since that. It was 1.113 million hooks in 1976 (Table 1).

Figure 3 shows relations between the hook rates, catch, yield and fishing intensity. The hook rates in 1976 was 0.56 %, higher than that in the previous year, with roughly the same catch of 580 thousand fish as that in the previous year despite the decreased 1976 effort. The yield, however, decreased to 24 thousand tons (Fig. 3) due to increase of small sized fish in the catch from Carib area.

4. Length composition of yellowfin tuna taken by the Japanese longline fleet in 1976

Figure 4 shows length frequency distribution of yellowfin tuna caught by the Japanese longline fleet in Carib and Guinea areas. Detailed data of its catch by 2-cm length class and quarter for the two areas are tabulated in Appendix Table 1.

Modal length of catch in the Carib area appears to be located in 96-100 cm and 112-116 cm classes and the 111-116 cm class fish are predominant in the composition. In 1976, fish larger than 120 cm decreased in the catch from the Carib area comparing to the 1975 length composition (Honma and Suzuki 1978, Fig. 4) and the predominant 112-116 cm modal class in 1976 was 24 cm smaller than the modal class in the previous year.

Most of fish from the Guinea area in 1976 are larger than 120 cm, with the 144-148 cm modal class. There are no appreciable changes in the length composition of yellowfin in the Guinea area between 1975 and 1976.

5. Trend of spawning indices

Spawning indices of yellowfin tuna exploited by the Japanese longline fleet has been kept stable in the low level during the period 1970 through 1976 (Fig. 5).

References


Fisheries Agency of Japan 1965. "Annual report of effort and catch statistics by area on Japanese tuna longline fishery, 1962". 183pp.

_____ 1966. "_____, 1963". 322pp.

_____ 1967a. "_____, 1964". 377pp.

_____ 1967b. "_____, 1965". 375pp.

_____ 1968. "_____, 1966". 299pp.

_____ 1969. "_____, 1967". 293pp.

_____ 1970. "_____, 1968". 283pp.

_____ 1971. "_____, 1969". 299pp.

_____ 1972. "_____, 1970". 326pp.

_____ 1973. "_____, 1971". 319pp.

_____ 1974. "_____, 1972". 279pp.

_____ 1975. "_____, 1973". 265pp.

_____ 1976. "_____, 1974". 267pp.

_____ 1977. "_____, 1975". 269pp.

_____ 1978. "_____, 1976". 264pp.

Honma, M. 1973. "Overall fishing intensity and catch by length class of yellowfin tuna in Japanese Atlantic longline fishery, 1956-1970". Col. Vol. Sci. Pap. Vol. 1, 59-77.

Honma, M. and Z. Suzuki 1978 "Overall fishing intensity, catch, catch by size and spawning indices of yellowfin tuna in the Atlantic tuna longline fishery, 1956-1975". ibid. Vol. 7, No. 1, 24-29.

Institute of Oceanography, National Taiwn University 1973. "Annual catch statistics of Taiwan's tuna longline fishery, 1971". 122pp.

_____ 1974. "_____, 1972". 156pp.

_____ 1975a. "_____, 1973". 120pp.

_____ 1975b. "_____, 1974". 128pp.

International Commission for the Conservation of Atlantic Tunas 1975. "Statistical Bulletin". Vol. 5.

_____ 1976. "_____". Vol. 6.

_____ 1977. "_____". Vol. 7.

Shiohama, T., M. Myojin and H. Sakamoto 1965. "The catch statistic data for the Japanese tuna longline fishery in the Atlantic Ocean and some simple considerations on it". Rept. Nankai Reg. Fish. Res. Lab. No. 21, 1-131.


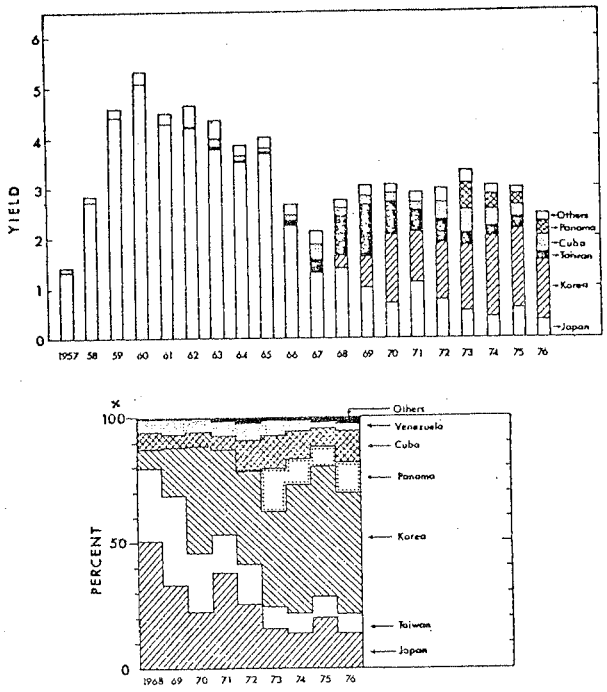


Fig. 1. Yield in ten thousand tons (upper panel, 1957-1976) and yield in percent (lower panel, 1968-1976) of yellowfin tuna by country in the Atlantic longline fishery.

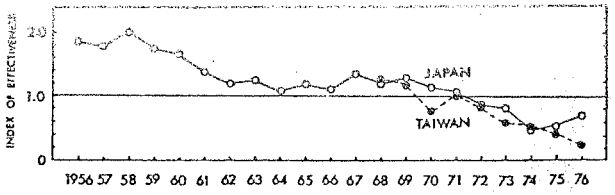


Fig. 2. Yearly change in indices of effectiveness of Japanese and Taiwanese longline fishery on yellowfin tuna in the Atlantic Ocean, 1956-1976.

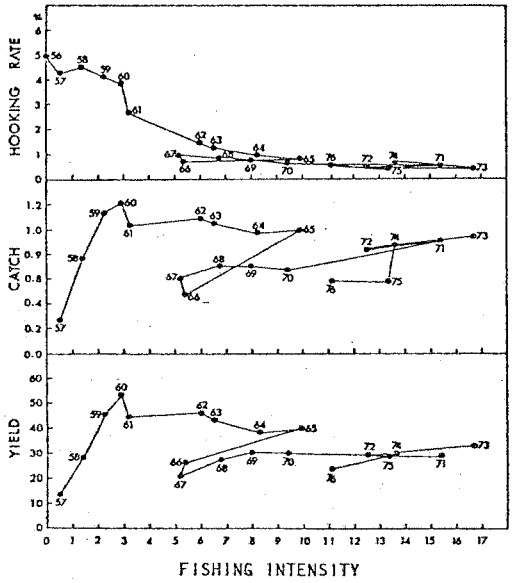


Fig. 3. Hook rate in percent (upper panel), catch in million fish (central panel) and yield in thousand tons (lower panel) of yellowfin tuna against overall fishing intensity in hundred thousand hooks per 5°square in the Atlantic longline fishery, 1956-1976.

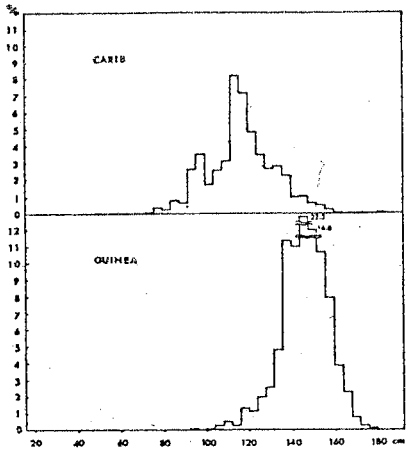


Fig. 4. Percentage length composition of yellowfin tuna caught by Japanese longline fishery in the Atlantic Ocean (CARIB and GUINEA areas) in 1976.

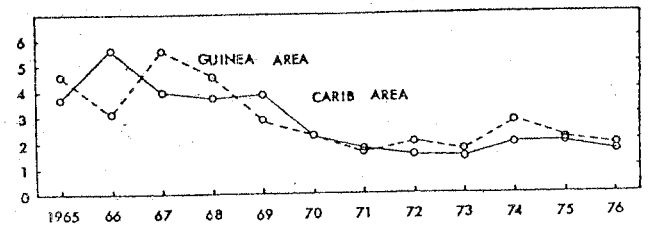


Fig. 5. Spawning index of yellowfin tuna in the Atlantic longline fishery of Japan, 1965-1976.

Appendix table 1. Catch of yellowfin tuna by length class in Japanese longline fishery, 1976.

A. CARIB AREA

| Length class | Jan.-Mar. | Apr.-June | July-Sep. | Oct.-Dec. | Total |
|---|---|---|---|---|---|
| 50 - 52 | - | - | 6 | - | 6 |
| 52 - 54 | - | 3 | - | - | 3 |
| 54 - 56 | - | - | - | - | - |
| 56 - 58 | - | - | - | - | - |
| 58 - 60 | 2 | - | - | - | 2 |
| 60 - 62 | - | - | - | - | - |
| 62 - 64 | - | - | 6 | - | 6 |
| 64 - 66 | - | - | 6 | - | 6 |
| 66 - 68 | - | - | 17 | - | 17 |
| 68 - 70 | 4 | - | 28 | - | 32 |
| 70 - 72 | 4 | 3 | 17 | - | 24 |
| 72 - 74 | 6 | - | 22 | - | 28 |
| 74 - 76 | 6 | 14 | 39 | 8 | 67 |
| 76 - 78 | - | - | 28 | - | 28 |
| 78 - 80 | 9 | 34 | 297 | 21 | 361 |
| 80 - 82 | 2 | 79 | 101 | 16 | 198 |
| 82 - 84 | 9 | 34 | 146 | 41 | 230 |
| 84 - 86 | 17 | 138 | 470 | 70 | 695 |
| 86 - 88 | 41 | 153 | 577 | 21 | 792 |
| 88 - 90 | 117 | 201 | 582 | 57 | 957 |
| 90 - 92 | 46 | 204 | 370 | 53 | 673 |
| 92 - 94 | 56 | 469 | 543 | 29 | 1097 |
| 94 - 96 | 91 | 820 | 1540 | 57 | 2508 |
| 96 - 98 | 113 | 1193 | 1529 | 53 | 2888 |
| 98 -100 | 105 | 986 | 2212 | 53 | 3356 |
| 100 -102 | 79 | 885 | 1277 | 33 | 2274 |
| 102 -104 | 87 | 509 | 963 | 61 | 1620 |
| 104 -106 | 205 | 472 | 1602 | 155 | 2434 |
| 106 -108 | 161 | 317 | 1887 | 49 | 2414 |
| 108 -110 | 209 | 401 | 3651 | 127 | 4388 |
| 110 -112 | 207 | 230 | 2402 | 98 | 2937 |
| 112 -114 | 209 | 543 | 4256 | 159 | 5167 |
| 114 -116 | 550 | 1244 | 5589 | 375 | 7758 |
| 116 -118 | 492 | 1074 | 4441 | 383 | 6390 |
| 118 -120 | 531 | 1495 | 4407 | 400 | 6833 |
| 120 -122 | 684 | 1535 | 1848 | 273 | 4340 |
| 122 -124 | 868 | 1953 | 1557 | 220 | 4598 |
| 124 -126 | 631 | 1897 | 1322 | 163 | 4013 |
| 126 -128 | 372 | 1645 | 1221 | 78 | 3316 |
| 128 -130 | 383 | 1484 | 1624 | 53 | 3544 |
| 130 -132 | 405 | 1187 | 874 | 45 | 2511 |
| 132 -134 | 277 | 1269 | 896 | 21 | 2463 |
| 134 -136 | 268 | 1057 | 1299 | 24 | 2648 |
| 136 -138 | 167 | 667 | 784 | 8 | 1626 |
| 138 -140 | 148 | 859 | 1142 | 12 | 2161 |
| 140 -142 | 87 | 486 | 498 | 12 | 1083 |
| 142 -144 | 48 | 401 | 493 | 4 | 946 |
| 144 -146 | 46 | 537 | 734 | 12 | 1329 |
| 146 -148 | 33 | 393 | 526 | 4 | 956 |
| 148 -150 | 55 | 415 | 666 | 8 | 1144 |

Table 1. Hook reat, catch in number, yield in weight and overall fishing intensity of yellowfin tuna in Japanese and Taiwnese longline fishery, and catch, yield and overall fishing intensity in the whole longline fishery in the Atlantic Ocean, 1956 - 1976.

| Year | Japanese longline fishery | | | | Taiwanese longline fishery | | | | Whole longline fishery | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hook rate (%) | Catch in number of fish | Yield in tons | Intensity in 1000 hooks per 5° square | Hook rate (%) | Catch in number of fish | Yield in tons | Intensity in 1000 hooks per 5° square | Catch in 1000 fishes | Yield in tons | Intensity in 1000 hooks per 5° square |
| 1956 | 4.91 | 12,028 | | 2.0 | | | | | . . | . . | 2.0 |
| 1957 | 4.28 | 258,544 | 13,198 | 48.3 | | | | | 272 | 13,894 | 50.9 |
| 1958 | 4.50 | 746,490 | 27,159 | 132.8 | | | | | 775 | 28,203 | 137.9 |
| 1959 | 4.10 | 1,097,535 | 44,071 | 216.4 | | | | | 1,144 | 45,927 | 225.5 |
| 1960 | 3.38 | 1,158,534 | 50,822 | 279.1 | | | | | 1,211 | 53,142 | 291.8 |
| 1961 | 2.65 | 980,339 | 42,609 | 303.2 | | | | | 1,034 | 44,929 | 319.7 |
| 1962 | 1.49 | 990,472 | 41,973 | 543.7 | . . | . . | 285 | . . | 1,096 | 46,434 | 601.5 |
| 1963 | 1.29 | 885,796 | 37,717 | 566.3 | . . | . . | 409 | . . | 1,022 | 43,522 | 653.4 |
| 1964 | 0.96 | 879,188 | 35,106 | 749.9 | . . | . . | 350 | . . | 968 | 38,660 | 825.9 |
| 1965 | 0.83 | 927,267 | 36,918 | 913.7 | . . | . . | 162 | . . | 1,006 | 40,068 | 991.6 |
| 1966 | 0.72 | 394,538 | 22,354 | 450.8 | . . | . . | 1,100 | . . | 471 | 26,690 | 538.2 |
| 1967 | 0.94 | 366,046 | 12,824 | 316.3 | . . | . . | 2,675 | . . | 598 | 20,935 | 516.4 |
| 1968 | 0.84 | 274,181 | 13,913 | 264.1 | 0.83 | 276,962 | 7,862 | 270.2 | 694 | 27,437 | 673.2 |
| 1969 | 0.76 | 241,832 | 9,966 | 260.9 | 0.66 | 233,743 | 10,798 | 286.9 | 694 | 30,302 | 799.5 |
| 1970 | 0.65 | 189,569 | 6,809 | 237.4 | 0.47 | 109,890 | 7,071 | 190.4 | 657 | 30,451 | 938.5 |
| 1971 | 0.56 | 292,062 | 11,026 | 425.5 | 0.40 | 188,972 | 4,370 | 394.4 | 905 | 28,953 | 1,541.9 |
| 1972 | 0.51 | 159,010 | 7,527 | 253.8 | 0.58 | 185,008 | 4,705 | 261.5 | 833 | 29,607 | 1,247.1 |
| 1973 | 0.48 | 108,585 | 5,349 | 184.1 | 0.44 | 120,199 | 2,655 | 219.0 | 948 | 33,153 | 1,669.6 |
| 1974 | 0.63 | 94,700 | 4,296 | 121.9 | 0.43 | 95,629 | 2,327 | 175.3 | 870 | 30,282 | 1,359.0 |
| 1975 | 0.40 | 116,319 | 5,958 | 239.8 | 0.27 | 46,060 | 2,362 | 136.0 | 575 | 29,475 | 1,331.6 |
| 1976 | 0.36 | 103,879 | 3,360 | 152.1 | 0.20 | 21,208 | 1,736 | 85.7 | 586 | 23,857 | 1,113.4 |

Appendix table 1. (continued) A. CARIB AREA (continued)

| Length class | Jan.-Mar. | Apr.-June | July-Sep. | Oct.-Dec. | Total |
|---|---|---|---|---|---|
| 150 -152 | 44 | 223 | 358 | - | 625 |
| 152 -154 | 15 | 172 | 269 | - | 456 |
| 154 -156 | 17 | 209 | 274 | - | 500 |
| 156 -158 | 11 | 68 | 129 | - | 208 |
| 158 -160 | 9 | 51 | 179 | - | 239 |
| 160 -162 | - | 25 | 67 | 4 | 96 |
| 162 -164 | - | 14 | 62 | - | 76 |
| 164 -166 | - | 11 | 56 | - | 67 |
| 166 -168 | - | 3 | 17 | - | 20 |
| 168 -170 | - | 3 | 56 | - | 59 |
| 170 -172 | - | 3 | 6 | 4 | 13 |
| 172 -174 | - | - | 6 | - | 6 |
| 174 -176 | 2 | 3 | 11 | - | 16 |
| 176 -178 | - | - | 6 | - | 6 |
| 178 -180 | - | - | 6 | - | 6 |
| 180 -182 | - | - | 6 | - | 6 |
| 182 -184 | - | - | - | - | - |
| 184 -186 | - | 3 | - | - | 3 |
| 186 -188 | - | - | - | - | - |
| 188 -190 | - | 3 | - | - | 3 |
| Total | 7928 | 28077 | 56003 | 3264 | 95272 |

Appendix table 1. (continued) B. GUINEA AREA

| Length class | Jan.-Mar. | Apr.-June | July-Sep. | Oct.-Dec. | Tatal |
|---|---|---|---|---|---|
| 92 - 94 | - | - | - | 1 | 1 |
| 94 - 96 | 11 | - | - | - | 11 |
| 96 - 98 | - | - | - | - | - |
| 98 -100 | - | 5 | - | 2 | 7 |
| 100 -102 | - | - | - | 3 | 3 |
| 102 -104 | - | - | - | 1 | 1 |
| 104 -106 | - | - | - | 10 | 10 |
| 106 -108 | - | - | - | 6 | 6 |
| 108 -110 | 21 | - | - | 7 | 28 |
| 110 -112 | - | - | - | 2 | 2 |
| 112 -114 | - | - | - | - | - |
| 114 -116 | 11 | 5 | - | 2 | 18 |
| 116 -118 | - | - | - | 3 | 3 |
| 118 -120 | 54 | 11 | - | - | 65 |
| 120 -122 | 43 | 5 | - | 2 | 50 |
| 122 -124 | - | 11 | - | 1 | 12 |
| 124 -126 | 43 | 5 | - | 1 | 49 |
| 126 -128 | 21 | 16 | 17 | - | 54 |
| 128 -130 | 54 | 27 | 17 | 1 | 99 |
| 130 -132 | 11 | 5 | 17 | - | 33 |
| 132 -134 | 11 | 16 | 42 | 7 | 76 |
| 134 -136 | 11 | 54 | 100 | 8 | 173 |
| 136 -138 | 11 | 44 | 133 | 1 | 189 |
| 138 -140 | 32 | 98 | 266 | 3 | 399 |
| 140 -142 | 11 | 54 | 216 | 2 | 283 |
| 142 -144 | 11 | 87 | 183 | 3 | 284 |
| 144 -146 | 32 | 164 | 416 | 2 | 614 |
| 146 -148 | 21 | 115 | 407 | 1 | 544 |
| 148 -150 | 43 | 125 | 399 | 2 | 569 |

Appendix table 1. (continued) B. GUINEA AREA (continued)

| Length class | Jan.-Mar. | Apr.-June | July-Sep. | Oct.-Dec. | Total |
|---|---|---|---|---|---|
| 150 -152 | 11 | 60 | 191 | - | 262 |
| 152 -154 | - | 65 | 174 | - | 239 |
| 154 -156 | 11 | 76 | 224 | - | 311 |
| 156 -158 | - | 27 | 174 | - | 201 |
| 158 -160 | - | 38 | 174 | - | 212 |
| 160 -162 | - | 44 | 100 | - | 144 |
| 162 -164 | - | 22 | 33 | 1 | 56 |
| 164 -166 | 21 | 16 | 58 | - | 95 |
| 166 -168 | - | 5 | 17 | - | 22 |
| 168 -170 | - | 5 | 33 | - | 38 |
| 170 -172 | - | - | - | - | - |
| 172 -174 | - | - | 8 | - | 8 |
| 174 -176 | - | 5 | - | - | 5 |
| 176 -178 | - | - | 8 | - | 8 |
| Total | 495 | 1210 | 3407 | 72 | 5184 |