Bigeye tuna and yellowfin tuna sex-ratio analysis from observer data obtained during the experimental cruise on Spanish longliners in the Southwestern Indian Ocean in 2005

by

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Abstract

This document presents the sex ratio results corresponding to bigeye tuna – BET (Thunnus obesus, Lowe 1839) and yellowfin tuna – YFT (Thunnus albacares, Bonaterre 1788) obtained by observers in experimental Spanish longline fisheries with several types of hooks and bait. The pilot action has been undertaken by two surface longliners that carried out their activities in 2005 (from mid December 2004 to mid December 2005). The working area was in international waters between 25º S and 35º S and 30º E and 50º E.

The sex of 1339 specimens of BET and 582 of YFT has been determined, resulting in a total of 621 (46%) males and 718 (54%) females in the case of BET, and 307 males (53%) and 275 females (47%) for YFT.

In the case of BET, it is shown a predominance of females in working area during the whole year; while in the case of YFT, females were predominant only for the third quarter of the year.

Although specimens of bigeye tuna has been caught with sizes ranging from 25 to 208 cm of furcal length (FL), practically all of them fell into sizes ranging from 80 to 139 cm of FL (95.2%), while yellowfin specimens sizes caught by long line in these campaigns ranged from 58 and 181 cm of furcal length (FL), with 91.9% of the samples concentrated between 125 and 164 cm of FL.

1. Introduction

As it has been mentioned in other papers, scientific observers have been present on the two participating vessels from the onset (mid December 2004) of these experimental fisheries, which consists of using several types of hooks (conventional and circular) and bait (mackerel and squids-like squid species). At all the sets the observers have collected data about the catches and biological data of the various species caught.

The pilot action – RAI- AP-08/2004 has already finalised and all data are available for the sex per size interval of the various species present in the catch.

This document presents the sex ratio results corresponding to bigeye tuna and yellowfin tuna from the data obtained.

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2. Material and Methods

The pilot action was undertaken by two surface longliners that commenced their activities on 12 December 2004. The working area has been in international waters between 25º S and 35º S and 30º E and 50º E (Figure 1).

Although there is a space – time stratification for sampling in the prospected area, it has not been taken into consideration for this document. Joint analysis has been made of all the specimens sampled since activities began (539 sets) for the entire area.

Given that tuna samples are gutted on board, scientific observers take the individual weight of each specimen, the size at the lowest centimetre (LF in cm), sex and the degree of gonad development.

The sex of 100% of tuna specimens caught was not collected owing to special characteristics of this fishery. So accessing to the entire catch by scientific observers was difficult.

Sizes have been grouped into 5 cm intervals for results presentation.

3. Results

Tables 1 and 2 show the results of sex-size sampling undertaken by observers till mid December of 2005 for BET and YFT respectively.

3.1 Bigeye tuna

Total caught of bigeye during this pilot action was 2004 specimens and observers determined sex of 1339 samples (67%), resulting in a total of 621 (46%) males and 718 (54%) females.

Figure 2 shows the size distribution of BET sampled on board and the sex ratio obtained from these data, grouped in 5 cm intervals.

Although two longliners have caught specimens of this tuna which sizes ranged from 25 to 208 cm of furcal length (LF), practically all of them fell into sizes ranging from 80 to 139 cm of LF (95.2%); moreover, 71.4% of total had sizes between 100 and 129 cm of LF.

A predominance of females is observed in sizes ranging from 75 cm to 130 cm, in 10 of 11 intervals shown. Males begin to be slightly more abundant from 130 cm, although from 145 cm there are fewer sampled specimens. These results are very similar to those found by Schaefer et al. (2005) in East Pacific Ocean. However, Fonteneau et al. (2005), from Atlantic Ocean data, have found a slightly predominance of males for all length intervals, being more abundant from sizes bigger than 170 cm of FL.

Seasonal variability of bigeye tuna was analysed for every quarter of the year, showing a predominance of females for the whole year in this area of Indian Ocean, noticing percentages ranging from 50% (second quarter) and 58% (first quarter). These results are shown in Figure 3.

Table 3 shows the percentage of bigeye females in every quarter of the year and the number of individuals from which the ratio has been obtained.

3.2 Yellowfin tuna

Both ships caught 842 specimens of yellowfin tuna and observers collected sex data from 582 of the samples (69%), which is broken down into 307 males (53%) and 275 females (47%). Practically all the yellowfin specimens caught by long line in these campaigns fall into sizes ranging from 95 and 174 cm of FL (Figure 4), with 92% of the samples concentrated between 125 and 164 cm of FL.

Figure 4 shows the histogram size distribution and the sex ratio, grouped in 5 cm intervals, and obtained for yellowfin tuna. For better represented sizes, the sex ratio is close to 50%. Values for sizes below 105 cm are difficult to interpret, given the limited number of specimens analysed. Similarly, there has been little sampling for sizes above 160 cm, although the decrease in the female percentage based on this size coincides with previous results (Ariz et al., 2005)

In any case, females are, generally, less abundant than the males for all the length intervals.

From 140 cm of FL, male's rate increases continually as it happens for this specie in Atlantic and Indian oceans (Fonteneau et al., 2005).

Figure 5 shows the relationship between sex ratio for yellowfin tuna in the sampling year. Only for the third quarter, the percentage of females is higher than the one for males (54%), pointing out values ranging from 42 and 49% during the rest of the year.

Table 3 shows the percentage of yellowfin females every quarter of the year and the number of specimens used to get the ratio.

References

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Table 1. *Sex of bigeye tuna specimens per size interval of 5 cm LF, obtained by observers on board the AP 08-2004, percentage of females per size interval and total*

Thunnus obesus (BET) ***Indian Ocean*** ***AP 08/2004*** ***Sex Ratio***				
LF (cm)	***Number of Males***	***Number of Females***	***Total***	***% Females***
25-29	-	1	1	100
30-34	-	-	-	-
35-39	-	-	-	-
40-44	-	-	-	-
45-49	-	-	-	-
50-54	-	-	-	-
55-59	-	-	-	-
60-64	2	1	3	33
65-69	3	1	4	25
70-74	1	1	2	50
75-79	5	12	17	71
80-84	13	17	30	57
85-89	35	37	72	51
90-94	34	27	61	44
95-99	21	30	51	59
100-104	77	82	159	52
105-109	119	122	241	51
110-114	96	104	200	52
115-119	36	68	104	65
120-124	55	80	135	59
125-129	48	69	117	59
130-134	40	33	73	45
135-139	17	15	32	47
140-144	11	5	16	31
145-149	2	7	9	78
150-154	1	3	4	75
155-159	2	1	3	33
160-164	1	1	2	50
165-169	-	-	-	-
170-174	1	-	1	-
175-179	-	1	1	100
180-184	-	-	-	-
185-189	-	-	-	-
190-194	-	-	-	-
195-199	-	-	-	-
200-204	-	-	-	-
205-209	1	-	1	-
Total	***621***	***718***	***1339***	***54%***

***Table 2**. Sex of yellowfin tuna specimens per size interval of 5 cm LF, obtained by observers on board the AP 08-2004, percentage of females per size interval and total*

Thunnus albacares (YFT) ***Indian Ocean*** ***AP 08/2004*** ***Sex Ratio***				
LF (cm)	***Number of Males***	***Number of Females***	***Total***	***% Females***
60-64	1	-	1	-
65-69	-	-	-	-
70-74	-	-	-	-
75-79	1	-	1	-
80-84	-	-	-	-
85-89	-	1	1	100
90-94	-	-	-	-
95-99	1	1	3	50
100-104	-	1	2	100
105-109	1	1	6	50
110-114	3	6	9	67
115-119	4	4	8	50
120-124	7	5	15	42
125-129	14	19	34	58
130-134	42	56	104	57
135-139	47	42	95	47
140-144	43	52	109	55
145-149	53	45	103	46
150-154	38	24	66	39
155-159	20	17	39	46
160-164	22	1	24	4
165-169	6	-	6	-
170-174	4	-	4	-
Total	***307***	***275***	***630***	***47%***

***Table 3**. Number of size length data with sex information obtained from Spanish longline fishery in south western Indian Ocean for BET and YFT. Data are calculated per species and quarter*

	Bigeye tuna (BET)				***Yellowfin tuna (YFT)***			
Quarter	***males***	***females***	***total***	***%females***	***males***	***females***	***total***	***%females***
Jan - Mar	115	158	273	***58%***	87	82	169	***49%***
Apr - Jun	168	170	338	***50%***	41	31	72	***43%***
Jul - Sep	231	268	499	***54%***	72	85	157	***54%***
Oct - Dec	107	122	229	***53%***	107	77	184	***42%***

***Figure 1**. Area covered by the AP 08-2004 and latitude and longitude of sets made during this campaigns.*

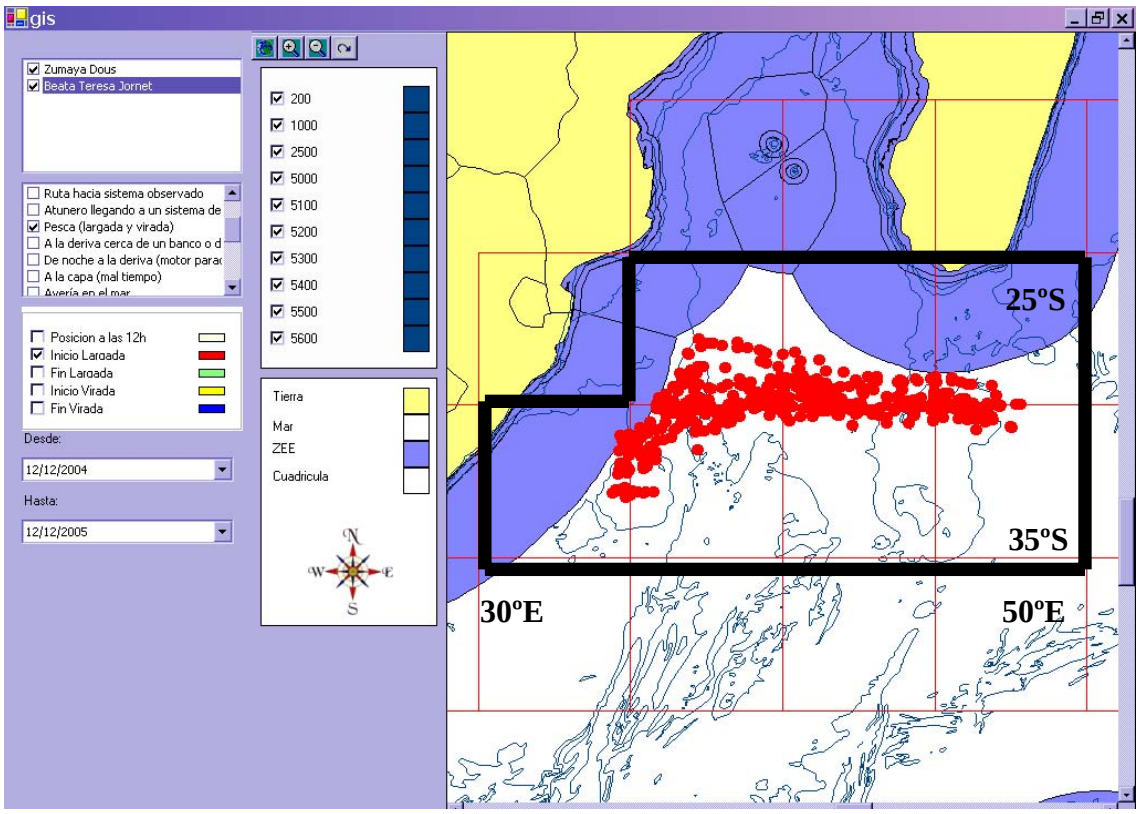


***Figure 2**. Size distribution of BET specimens sampled for sex analysis, grouped in intervals of 5 cm of FL to the low centimetre.*

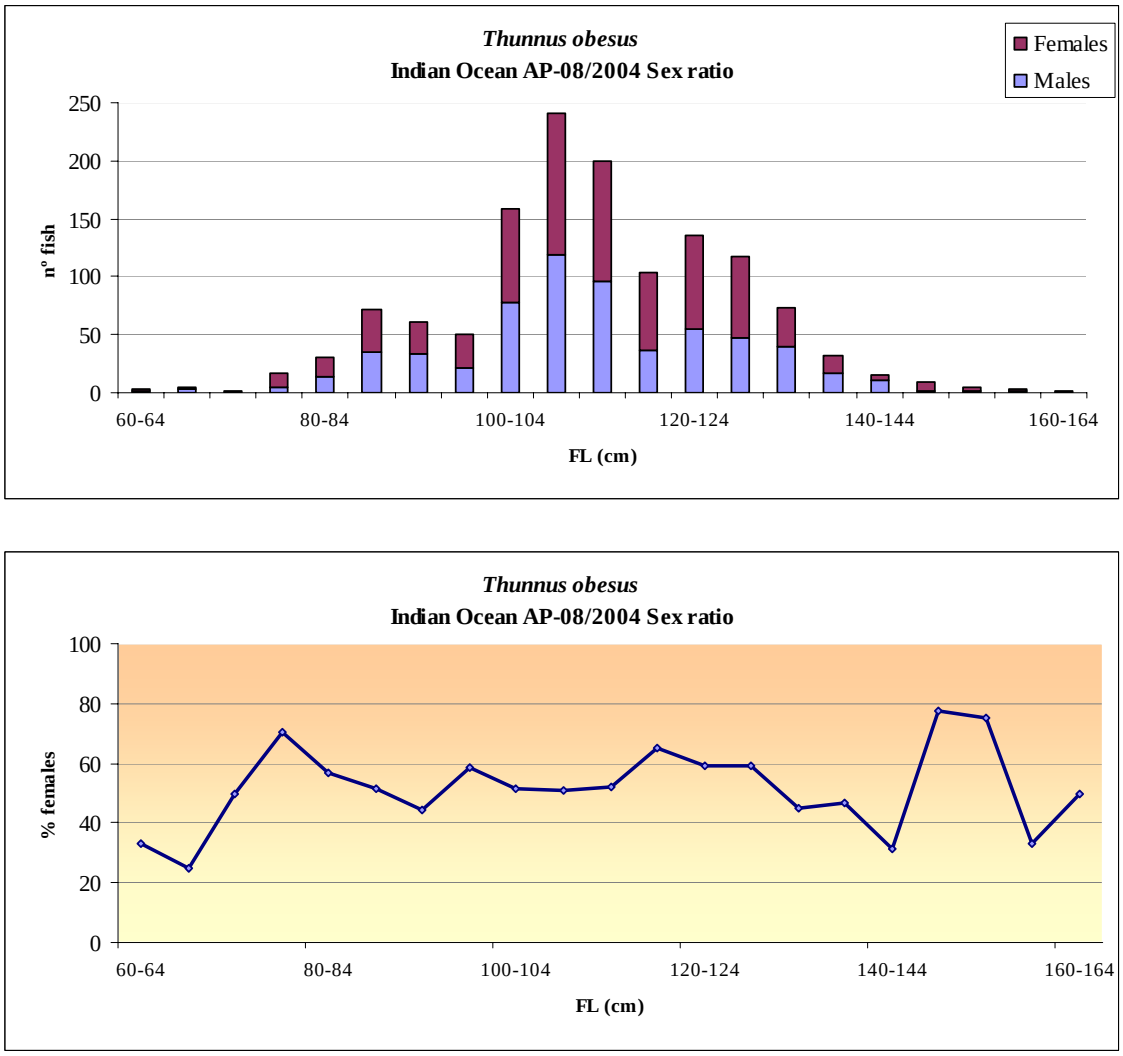


***Figure 3**. Sex ratio for bigeye tuna (BET) caught by Spanish longline in the South Western Indian Ocean. Data are represented by quarter and species.*

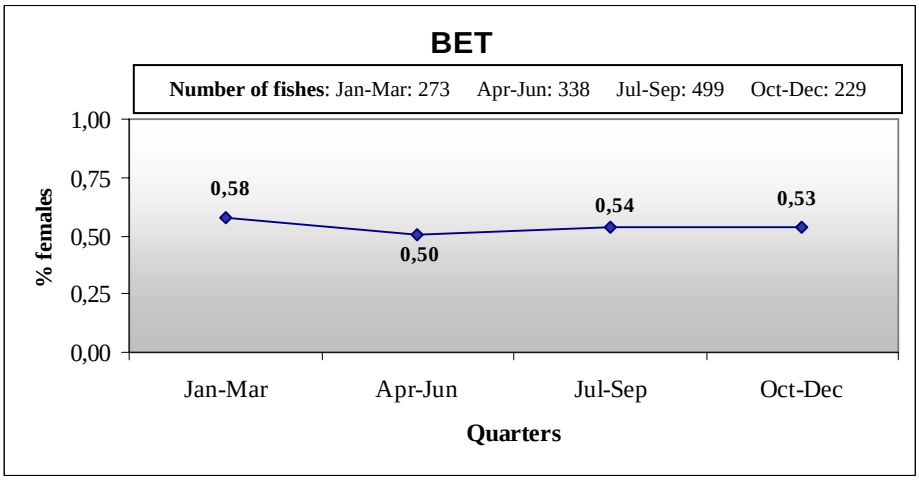
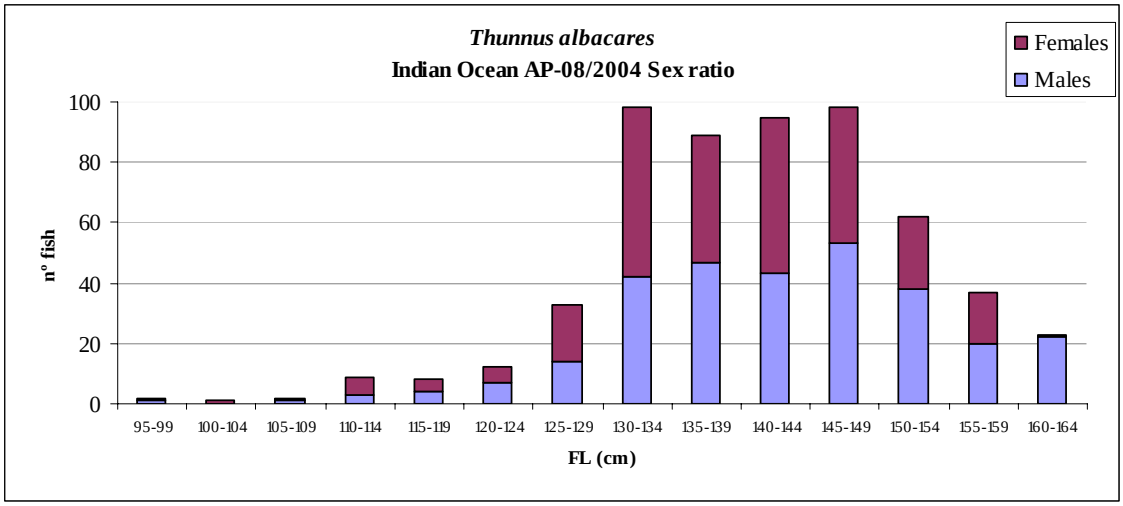


***Figure 4**. Size distribution of YFT specimens sampled for sex analysis, grouped in intervals of 5 cm of FL to the low centimetre.*



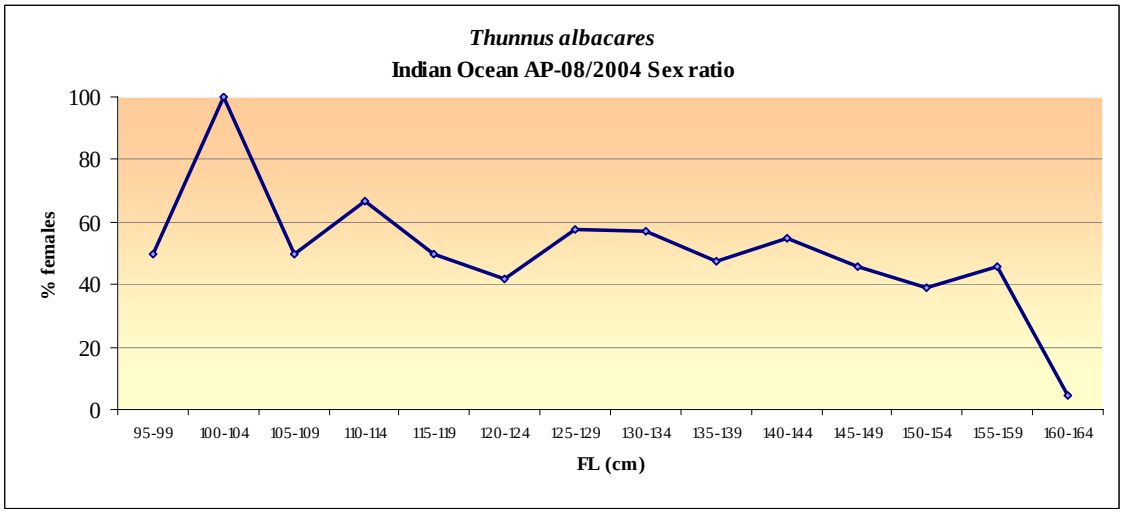


***Figure 5**. Sex ratio for Yellowfin tuna (YFT) caught by Spanish longline in the South Western Indian Ocean. Data are represented by quarter and species.*