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Review of yellowfin tuna catch by Korean longline fleet in the Indian Ocean

Z. G. Kim, S. I. Lee, D. Y. Moon and D. W. Lee

Natinal Fisheries Research and Development Institute
Haean-ro 216, Gijang-eup, Gijang-gun, 619-705, Busan, Korea

Introduction

Longline is the only type of gears for Korean tuna fisheries in the Indian Ocean. It was started with a small experimental longline fishing in the Indian Ocean in 1957, which was the first instance of Korean distant-water fisheries. After that, Korean longline fishery was expanded to the other oceans and became one of forces for the early period of Korean economic development by the 1960-70s. Catch statistics have been available since the mid-1960s. The main species were yellowfin tuna, bigeye tuna and albacore tunas from the beginning, to which southern bluefin tuna was included from 1991. At the outset, fishing grounds were around the central tropical area between 20^{o}N and 20^{o}S and then extended southward to 45^{o}S.

The total annual catches of tuna and tuna-like species by Korean longline fisheries in the Indian Ocean steeply increased from the begining of the mid-1960s and peaked at 71,100 mt in 1978 and then largely decreased with fluctuation thereafter (Table 1, Fig. 1). The catch trend closely coincided with the changes in the number of vessels active throughout the periods, in which the number were 185 vessels in 1975 and then decreased to 7 vessels in 2010 (Fig. 2). The yellowfin tuna was the top component of the Korean longline catch along with bigeye tuna, which considerably increased from the beginning and peaked at 33,237 mt in 1977 but had decreased with fluctuation to 708 tons in 2010 (Fig. 1).

In this document, we described the historical Korean longline catch and effort of yellowfin tuna.

Data source

The catch in the number of fish and the effort in the number of hook were the data aggregated by month and 5°x5°block which the National Fisheries Research and Development Institute (NFRDI) have compiled from the logbook submitted by the fishermen of the longline vessels. These data are

available for 1975-2010. Size data were obtained from the Korean national scientific observer program. These data are only available for a few years of 2003-2010.

Trend of catch and effort

The fishing efforts in the number of hooks were the highest at 64,797 thousands in 1978 but significantly decreased with fluctuation to 7,786 thousand hooks until 1999 and stable around 5000-12,000 thousands since then until recent years and likewise were its corresponding catches in the number of fishes that peaked at 737 thousand fishes in 1978 but decreased below 10s thousand fishes in recent years (Table 2, Fig. 3). Yellowfin tuna was top component along with bigeye tuna in Korean longline catch throughout the periods, where the two species were turning over and over between 32.3% and 53.5% until 1992, and then it was lower than bigeye in catch proportion until 2000 but, since then, higher (Fig. 4). The CPUEs peaked at 19 fishes/1000hooks in 1977 but were 33% of its peak from 1978 to 1992, 13% from 1993 to 2002 but increased to 37% from 2003 to 2007 and then decreased to 13.4% in recent years (Fig. 5).

The decadal and spatial distribution of fishing efforts, catches and CPUEs of bigeye tuna caught by Korean longline fishery are shown in Fig. 6 and the those information of the recent 5 years are shown in Fig. 7.

In terms of overall feature of Korean longline fishery in the Indian ocean, it was apparent that efforts and catch calminated in the late 1970 and, since then, largely decreasing, especially showing prominent decreases in 1984, 1992 and 1999 (Fig. 4). These were known as a deliberate withdrawl of fishing efforts due to some fishing operational reasons.

When the catch were high and recorded the its peak in 1978, the efforts were deployed between 15^{o}N and 15^{o}S of the eastern Indian Ocean and 15^{o}N and 40^{o}S of the wesrwen Indian Ocean, with higher density in the tropical western area between 40^{o}E and 60^{o}E and, to lesser extent, in the south-western area around 30^{o}S and in the area off north-western Australia, while the catches of yellowfin tuna (No. of fish) were higher in the western Indian Ocean between 15^{o}N and 15^{o}S, as were the CPUEs (Fig. 6).

In 1980s, the efforts were deployed with slight decreasing by 70% in average of the previous period but concentration on the western trophical area. The catch were mainly occurred in the western trophical area off Africa with large decreasing to 27.5% of its peak at 550 thousand hooks in 1978 but the nominal CPUEs were high along the edge of the Ocean and trended stable (Fig. 6, 4 and 5). In 1990s, the efforts expanded further southward but reduced by 30% from its peak in 1978. the catch of yellowfin tuna were distributed along off the eastern Africa with 12.1% of its peak. The CPUEs were high in the southern edge of the ocean with 18.3% of its peak. In 2000s, The efforts that

were about 14% in average of its peak in 1978, were deployed in the same areas as in the previous decade. The catches were high along off the eastern Africa with 7.7 % of its peak, as were the CPUEs with increasing to 37.7% of its peak then decreasing to the level of previous decade. The efforts, catches and CPUEs of bigeye tuna for the recent years from 2006 to 2010 were shown in Fig. 7. Most of the fishing efforts were deployed off the eastern African continent in 2006 and 2007. Since then, the effort deployment were getting reduced from the trophical areas off eastern Africa, especially from Somalian waters, while it moved southward to the south of Madagascar and to the west-south off Australia. The catch were distributed along off the eastern Africa with density moving southward year by year, as were the CPUEs (Fig. 4 and 5). It was clear that dislocation of fishing ground of yellowfin for Korean longline fleet from the trophical areas to subtrophical areas in recent years (Fig. 4, and 7).

Size data

The length frequency data of bigeye tuna were soley available for 2003-2010, which were compiled from Korean scientific observation (Fig. 8, 9). In general, length frequency distribution ranged from 97 to 187 cm in fork length with a main mode around 120-140 cm and a secondary mode around 150-170, and with individuals less than 100 cm in 2003-2010. The main mode groups prevailed for all. The secondary mode groups dominated in 2008 and 2009, and the individuals with small length appeared in 2006, 2009 and 2010. It was observed that there were no significant different in length frequency distribution between area (eastern and western) for all years.

Table 1. Yellowfin catch in weight (t) caught by Korean longline fishery. Western: FAO area No. 51 (mostly west of 80°E), eastern: FAO area No. 57 (mostly east of 80°E). Data source: IOTC database.

Year	Eastern	Western	Total
1965		81	81
1966		140	140
1967		362	362
1968		5,284	5,284
1969		9,189	9,189
1970		5,280	5,280
1971		7,477	7,477
1972		10,325	10,325
1973		10,847	10,847
1974		13,234	13,234
1975	3,181	10,364	13,545
1976	5,207	8,645	13,852
1977	6,873	26,365	33,238
1978	7,449	19,247	26,697
1979	7,263	10,802	18,065
1980	5,705	7,580	13,285
1981	1,855	10,613	12,469
1982	575	18,824	19,398
1983	822	15,433	16,255
1984	776	9,461	10,237
1985	627	11,910	12,537
1986	841	14,637	15,479
1987	871	12,370	13,241
1988	1,091	13,099	14,191
1989	907	7,806	8,713
1990	425	7,078	7,503
1991	115	3,046	3,161
1992	244	4,161	4,405
1993	178	4,153	4,331
1994	14	3,862	3,876
1995	18	2,574	2,592
1996	21	3,744	3,766
1997	35	3,941	3,976
1998	50	2,505	2,554
1999	87	929	1,016
2000	129	1,833	1,963
2001	169	1,393	1,562
2002	90	258	348
2003	421	1,739	2,160
2004	1,325	2,848	4,173
2005	849	2,668	3,517
2006	1	3,443	3,444
2007		3,589	3,589
2008	16	1,011	1,027
2009	120	925	1,045
2010	46	656	702

Table 2 : Annual fishing effort (number of hooks) for the Korean longline fishery and its catch in number by species.

Year	No. of Hook (X1,000)	Catch in number (X1,000)						
		ALB	YFT	BET	SBT	SWO	STM	BUM
1971	79	0	0	1	0	0	0	0
1972	1,661	21	45	14	0	0	3	0
1973	1,627	39	6	5	0	0	0	0
1974	5,293	23	29	27	0	0	1	1
1975	17,671	43	85	129	0	4	5	3
1976	132	0	0	2	0	0	0	0
1977	10,558	7	201	178	0	4	8	6
1978	64,797	158	550	737	1	14	28	21
1979	29,356	19	181	239	3	7	14	11
1980	58,876	45	268	459	2	12	31	14
1981	46,420	31	277	314	0	10	15	10
1982	52,142	19	398	348	1	12	14	9
1983	62,686	32	403	378	0	15	16	12
1984	23,255	9	137	132	0	6	8	4
1985	34,090	17	239	204	0	11	12	7
1986	43,007	32	375	262	0	17	20	8
1987	44,001	21	348	315	0	19	17	7
1988	51,054	21	337	327	0	23	15	8
1989	52,985	12	216	234	0	20	11	7
1990	39,112	9	151	188	0	17	5	5
1991	11,731	2	83	54	0	6	8	2
1992	17,644	8	104	104	0	13	8	5
1993	24,837	6	114	129	0	24	9	6
1994	25,739	8	71	152	0	25	8	6
1995	18,554	7	56	123	0	18	11	5
1996	30,397	8	77	227	15	22	13	7
1997	35,644	12	90	193	24	19	6	7
1998	14,150	7	42	47	8	8	3	4
1999	7,786	1	10	18	16	1	0	1
2000	9,694	4	21	41	5	4	2	3
2001	9,736	3	37	21	11	5	1	2
2002	5,245	2	5	2	15	0	0	0
2003	7,510	6	48	30	3	3	0	1
2004	12,202	11	107	43	2	7	1	2
2005	6,522	10	56	24	1	6	0	1
2006	11,053	13	55	30	4	4	1	1
2007	9,500	16	58	16	7	3	0	1
2008	7,279	10	16	7	17	1	0	0
2009	11,718	31	25	13	23	1	0	1
2010	5,079	27	17	5	10	1	0	0

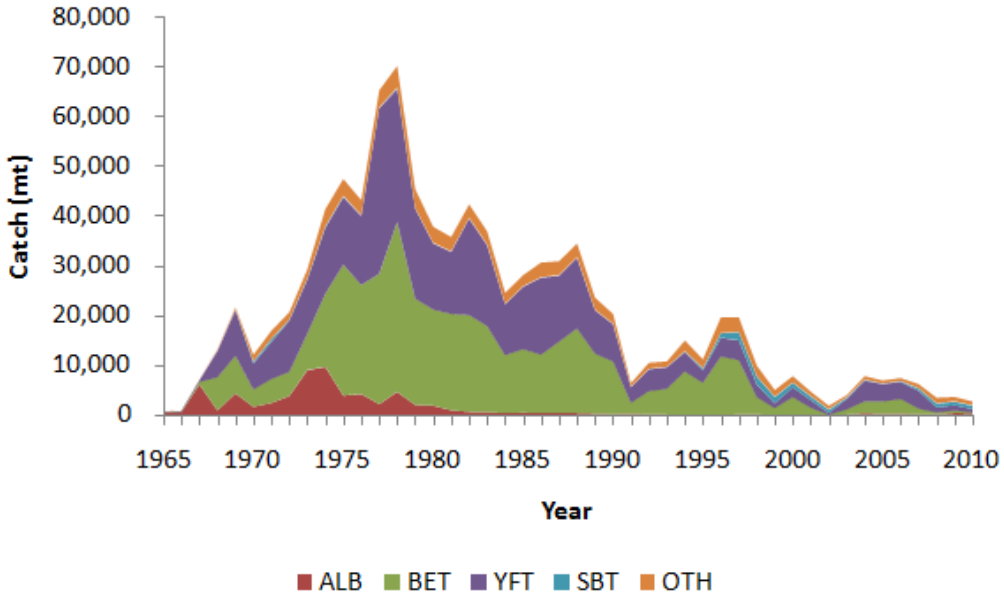

Fig.1. Historical catches of target species by Korean longline fishery in the areas of the IOTC competence.

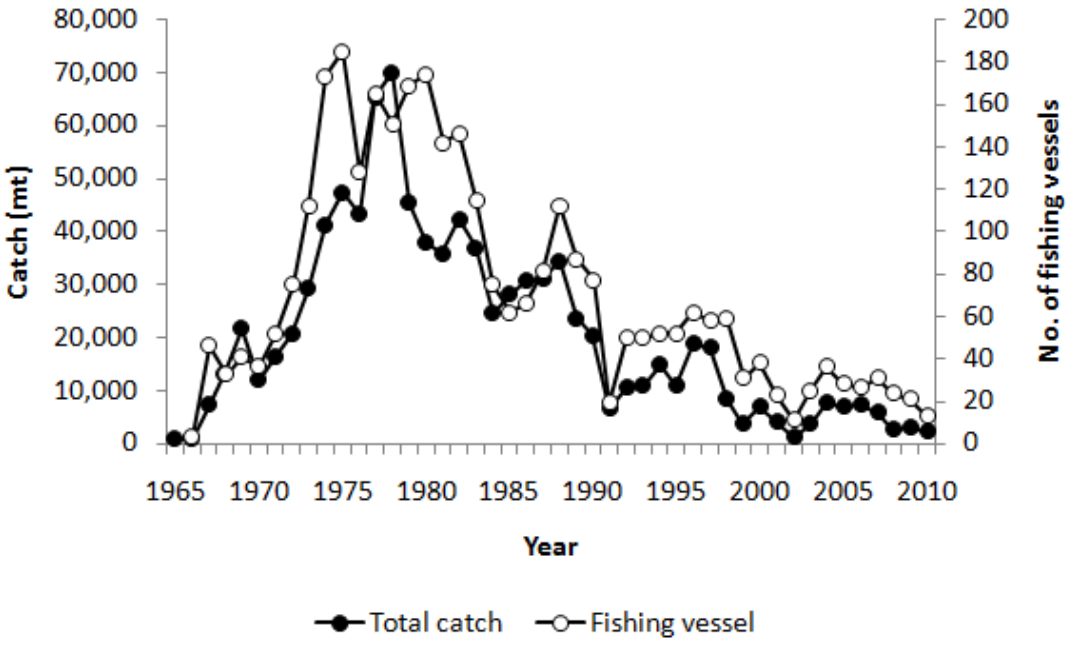

Fig.2. Historical total Korean longline catch and the number of longline vessels active in the areas of the IOTC competence.

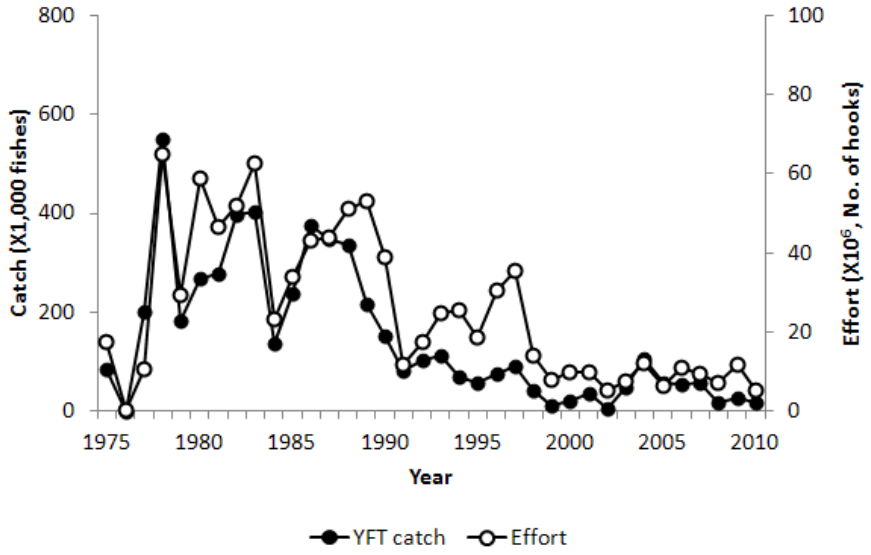

Fig.3. The number of hooks employed and yellowfin catch by Korean longline vessels

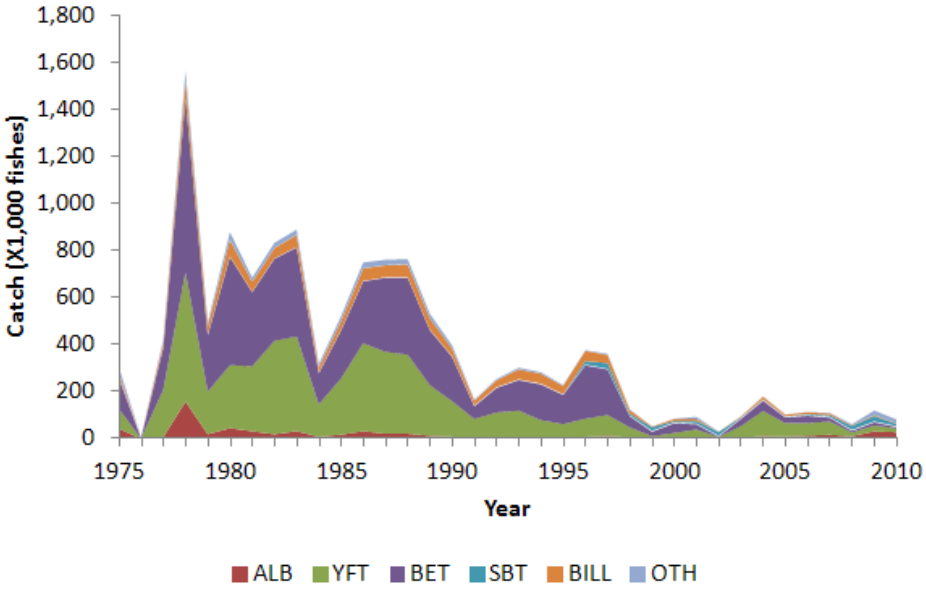

Fig. 4. The species composition in the number of fishes derived from the logbook submitted by Korean longline vessels.

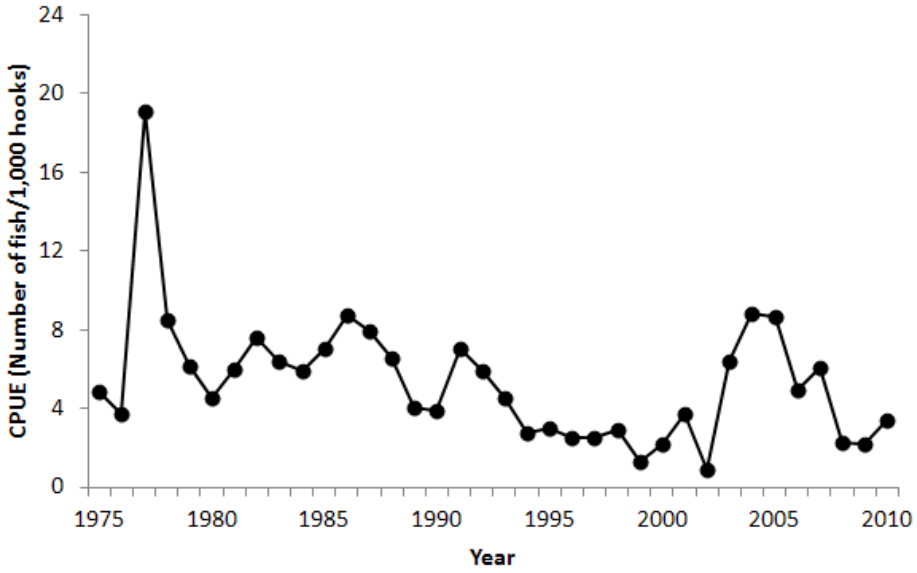

Fig. 5. The nominal CPUE of yellowfin caught by Korean longline vessels.

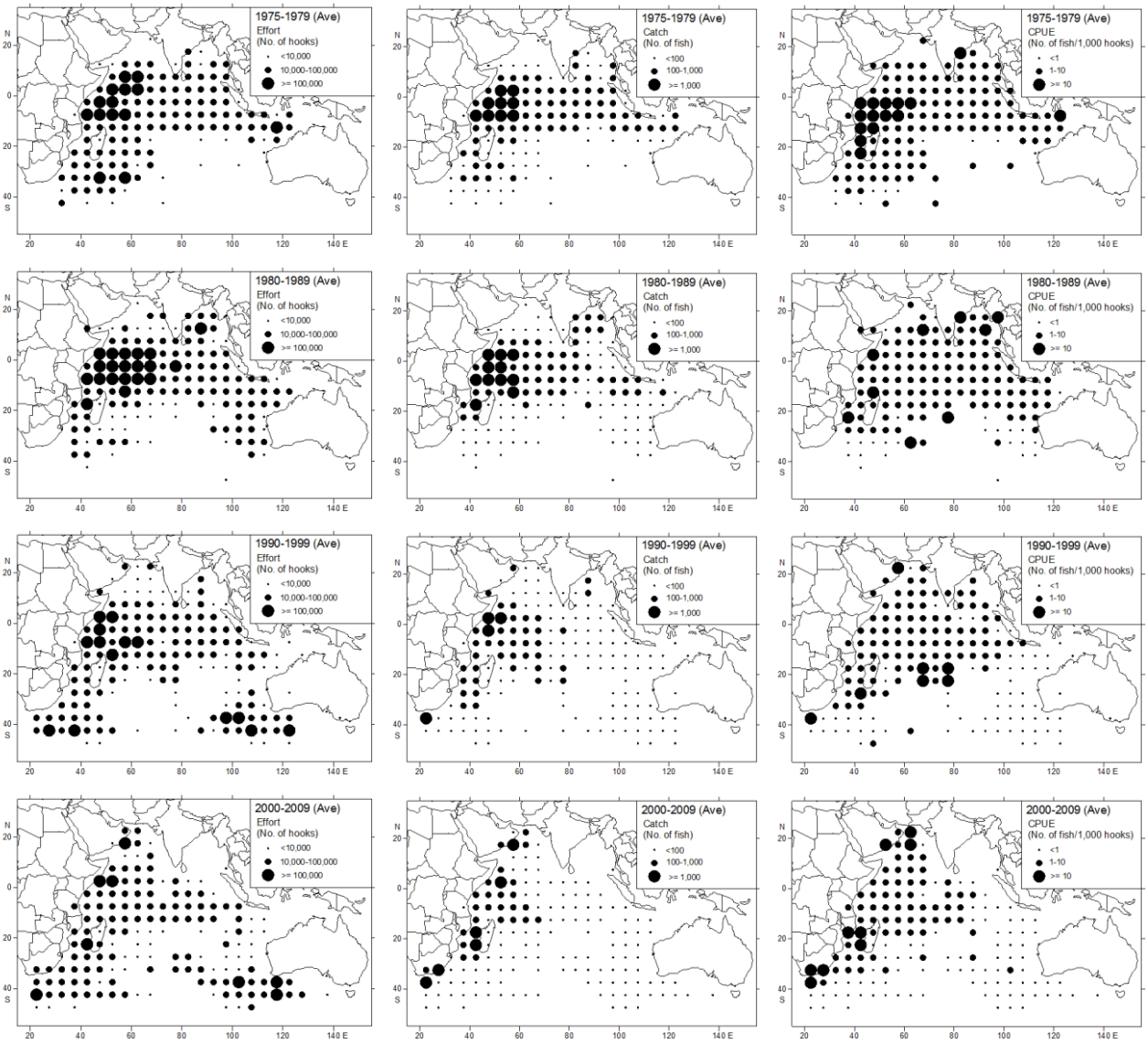

Fig. 6. The geographical distribution of Korean longline effort (number of hooks), yellowfin catch and CPUE by each decade.

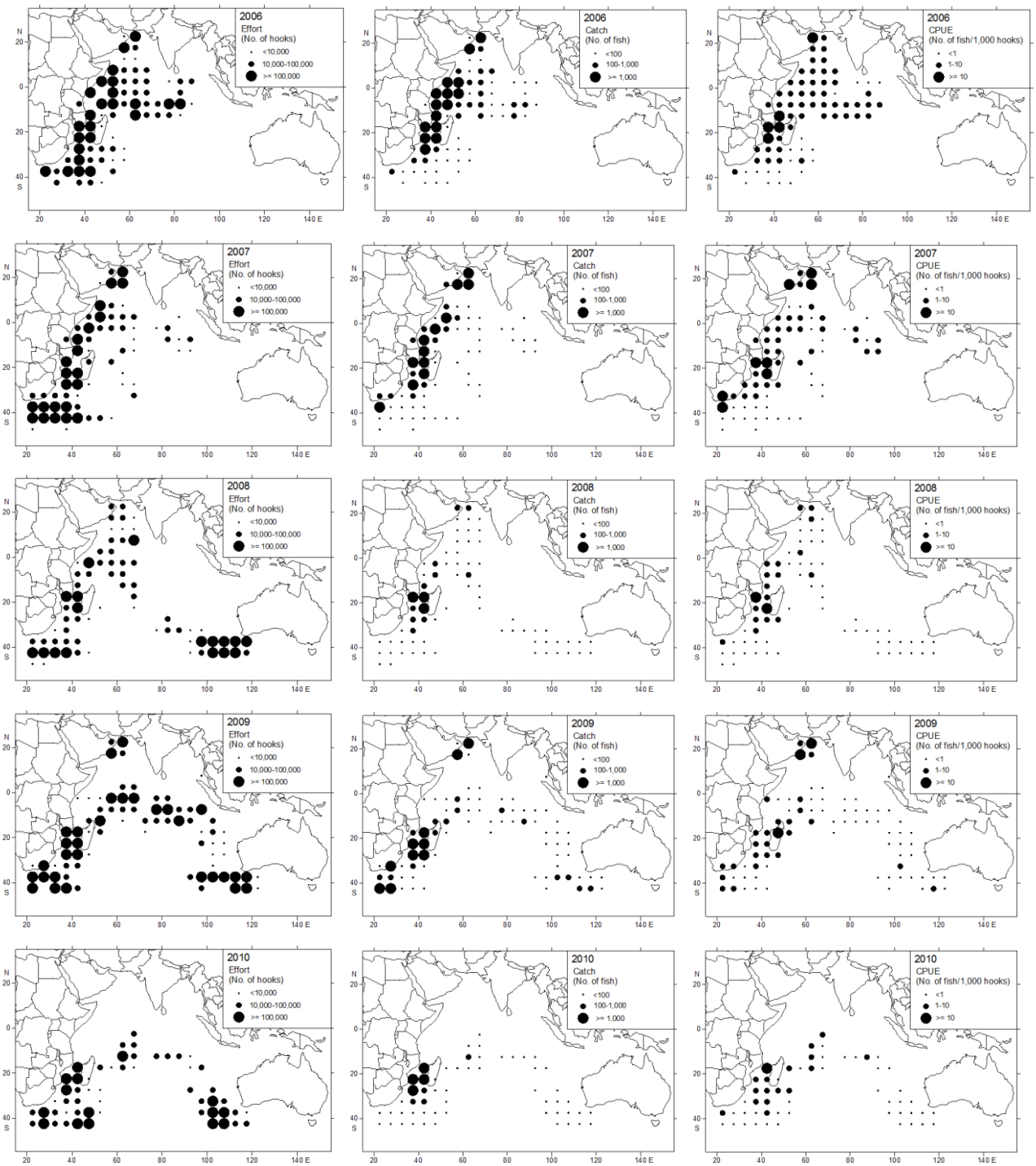

Fig. 7. The geographical distribution of Korean longline effort (number of hooks), yellowfin catch (number of fish) and CPUE (number of fish/1,000 hooks) in recent years

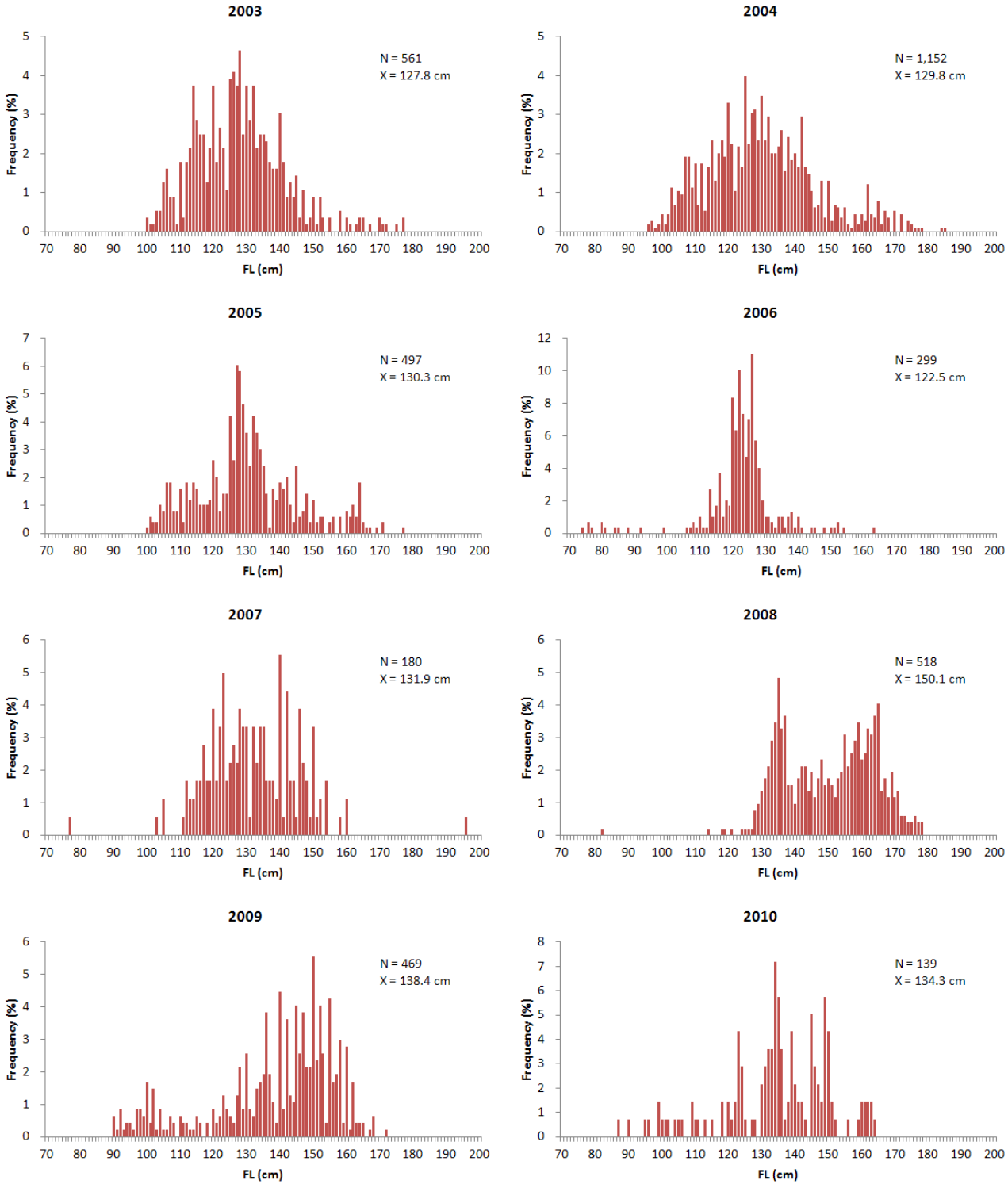

Fig. 8. Length frequency distribution of yellowfin obtained from scientific observation by year in the Indian Ocean.

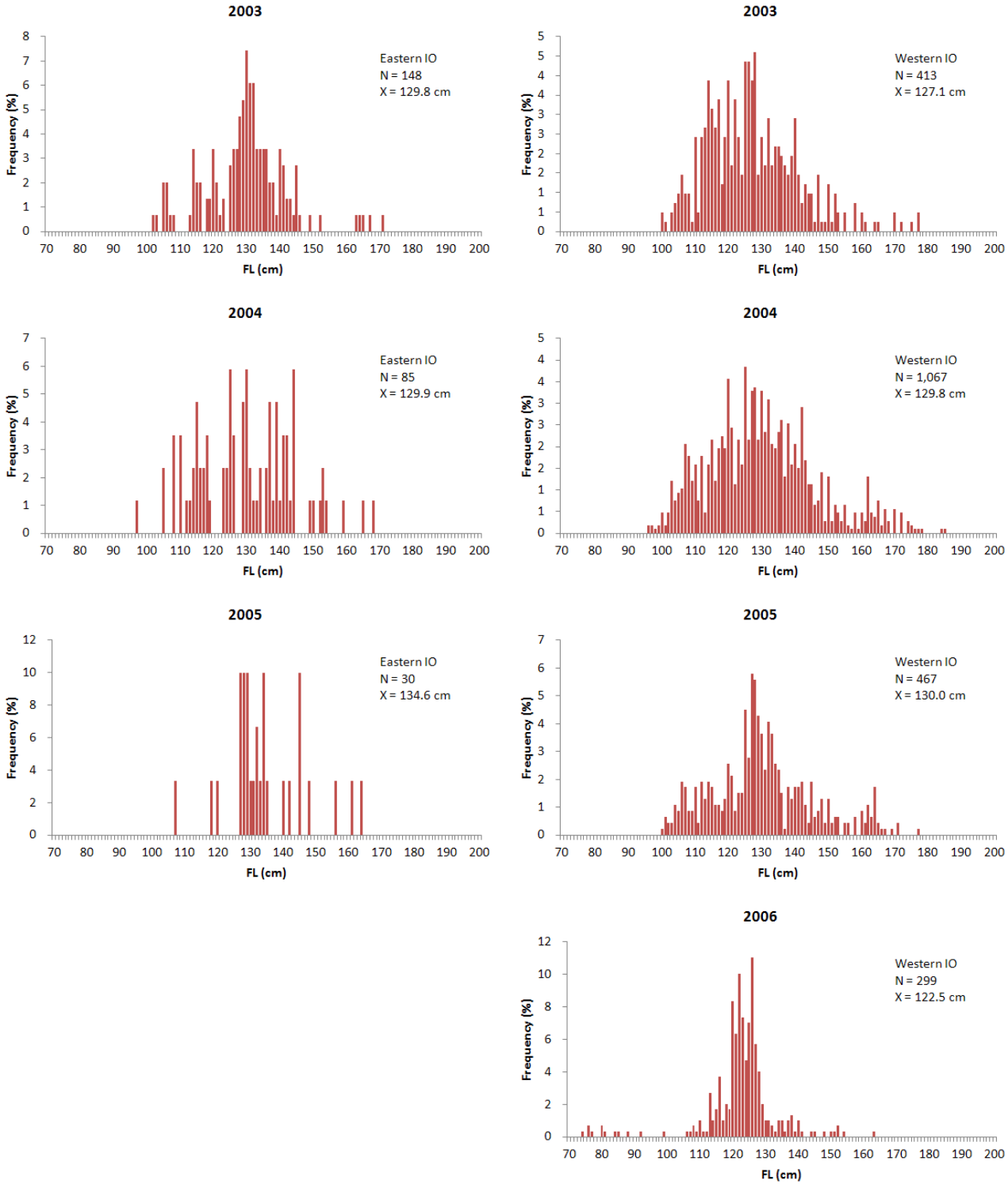

Fig. 9. Length frequency distribution of yellowfin tuna obtained from scientific observation by area in the Indian Ocean

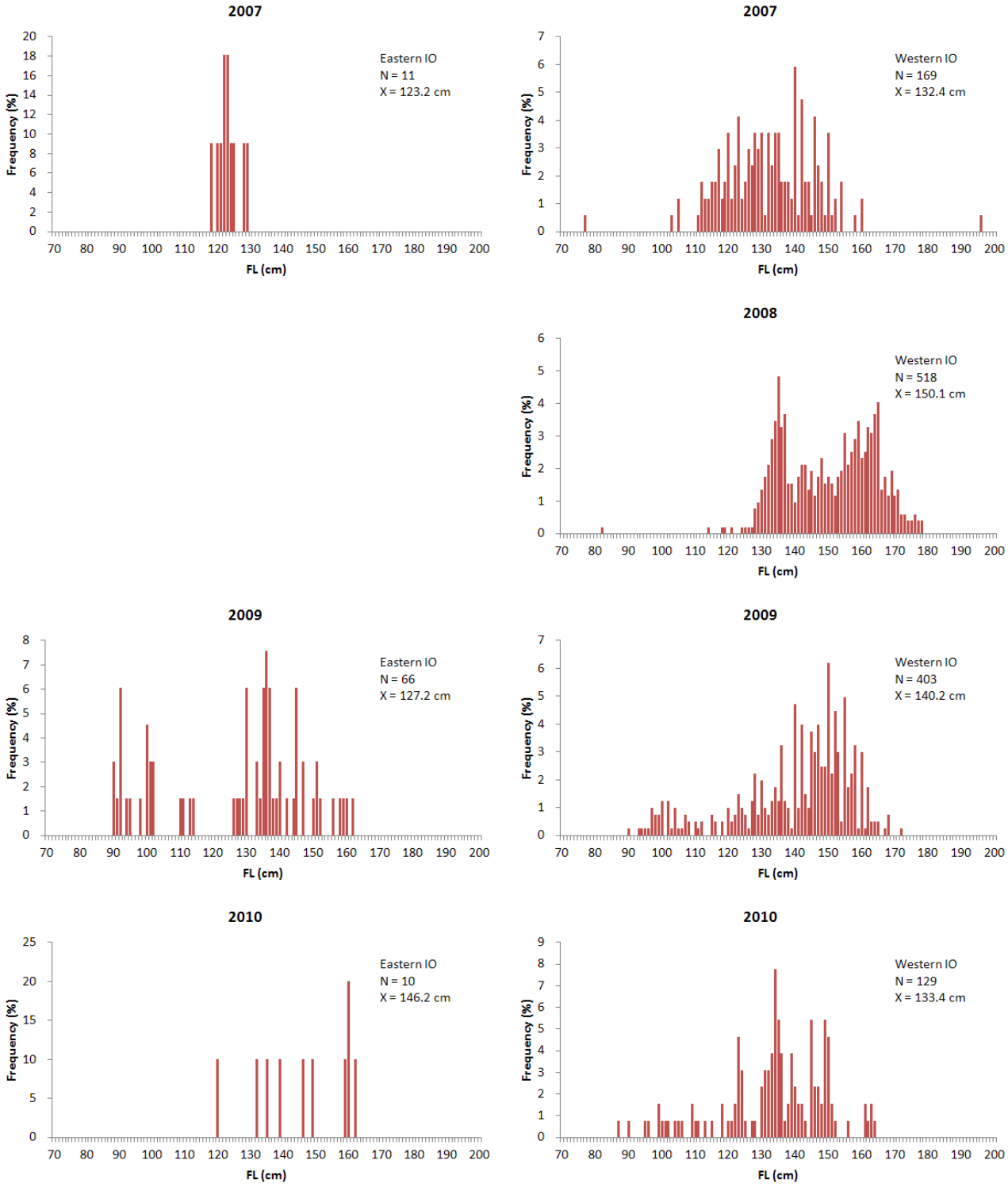

Fig. 9. Continued.