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Review of catch and effort for albacore tuna by Korean tuna longline fishery in the Indian Ocean (1965-2013)

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Abstract

This paper describes the fishing characteristics of Korean tuna longline fishery and its catch and CPUE trend for albacore tuna in the Indian Ocean from 1965 to 2013. The number of active fishing vessels showed the highest in the mid-1970s, since then it has sharply decreased and reduced to 7 vessels in 2011 and 2012. In recent years, it is showing a slight increasing, which was 9 vessels in 2013. The albacore tuna catch peaked at about 10 thousand mt in 1974 and decreased sharply thereafter. It has started to increase since the mid-2000s, which was 582 mt in 2013. The CPUE of albacore tuna showed a steady trend from 1977 to 2002 except a jump in 1978, and has been increasing thereafter. In the 1970s and 1980s, the fishing ground of albacore tuna by Korean longline fishery was formed between 10°N and 40°S of the western and eastern Indian Oceans but it moved gradually to the southern of the Indian Ocean thereafter, and was formed mainly between 20°S and 40°S of the western and eastern Indian Oceans in recent years.

Introduction

Korean tuna longline fishery begun with a small experimental fishing in the Indian Ocean in 1957, which was the first instance of Korean distant-water fisheries, but its catch statistics have appeared since the mid-1960s. Its target species have been yellowfin tuna, bigeye tuna and albacore tuna, but albacore tuna became non-target species from the early 1980s to the mid-2000s. And southern bluefin tuna has been included in the target species of Korean tuna longline fishery since 1991 as it became of the highest value in Japanese sashimi market. The traditional fishing grounds of Korean tuna longline fishery were around the central tropical area between 20^{o}N and 40^{o}S and have concentrated in the area of 20^{o}S and 40^{o}S since 1991 due to fishing for southern bluefin tuna. In recent years, its fishing ground ranged over 20^{o}S-45^{o}S and 20^{o}E-120^{o}E.

The aim of this study is to provide information on fishing characteristics of Korean tuna longline fishery and to review historical catch and effort for albacore tuna by Korean tuna longline fishery.

Data and Methods

The catches of tuna and tuna-like species caught by Korean tuna longline fishery in the Indian Ocean were referred to the Indian Ocean Tuna Commission (IOTC) database. The data of catch (number of fishes) and efforts (number of hooks) were aggregated by month and 5°x5° area which the National Fisheries Research and Development Institute (NFRDI) has compiled from the logbook submitted by captain onboard.

The historical catch trend of Korean tuna longline fishery in the Indian Ocean was investigated using the IOTC database from 1965 to 2013 and the fishing characteristics by period (5 years) and area (5°×5° block) was investigated using logbook data from 1977 to 2013.

Results and Discussion

The total catch of tuna and tuna-like species by Korean longline fishery in the Indian Ocean steeply increased from the beginning of the mid-1960s to 1978 when it peaked at about 70 thousand mt, and showed a sharp-stepwise decreasing with a fluctuation thereafter (Fig. 1). The number of active fishing vessels of Korean longline tuna fishery also recorded the highest of 185 vessels in 1975, since then it has sharply decreased with fisheries operational conditions and reduced to 7 vessels in 2011 and 2012. In 2013 it showed a slight

increasing, which was 9 vessels (Fig. 1). The catch trend generally followed the number of vessels engaged in fishing from the beginning to the recent years.

As for the annual catch proportion by species, albacore tuna, along with bigeye tuna and yellowfin tuna, was main species which accounted for average of 35% until 1974, since then it decreased dramatically while bigeye tuna and yellowfin tuna were target species which accounted for average of 80% until 2007. After that the catch of southern bluefin tuna increased with a proportion of 20-40% and that of albacore increased as well (Fig. 2).

In case of albacore tuna, its catch had increased from the mid-1960s to 1974 when showed the highest of about 10 thousand mt, after then it sharply decreased. During the 1990s, it had remained in the lowest level below 200 mt, and since 2009 it has increased and showed over 500 mt in 2013 (Table 1).

The fishing effort (×1,000 hooks) of Korean tuna longline fishery had shown a high level of over 100 thousand hooks until 1980, but since then it has decreased, which showed a level of below 10 thousand hooks in recent years (Fig. 3). The nominal CPUE of albacore tuna generally showed a steady trend from 1977 to 2002 except a jump in 1978, and has been increasing thereafter. In particular, it increased dramatically during 2010-2013, which showed the highest level of about 9 fishes/10^3 hooks in 2013 (Fig. 4).

Fig. 5 shows the changes in the number of hooks between floats (HBF) used in Korean tuna longline fishery. The main HBF was below 9 hooks (regular) from the mid-1970s to the mid-1980s, and 10-14 hooks (deep) were mainly used from the mid-1980s to the mid-1990s. Since then it was increased more than 15 hooks (ultra deep) and mainly used until the mid-2000s, but 10-14 hooks (deep) were mainly used in recent years.

From the late 1970s to the first half of 1980s, the fishing efforts were concentrated in the western and eastern tropical area between 10^oN-10^oS of the Indian Ocean, which mainly targeted bigeye tuna and yellowfin tuna, and their catches were relatively higher in the western part. Particularly, in the late 1970s the vessels fishing for albacore tuna operated in the western area around 20^oS-35^oS. From the second half of 1980s to the first half of 1990s, the fishing efforts were concentrated relatively higher in the western part of tropical area than those of previous years. Since the second half of 1990s the fishing efforts have moved southward to fish southern bluefin tuna in the western and eastern Indian Oceans around 30^oS-40^oS. In the recent years, a large part of fishing vessel has operated at the south of 20^oS in the western and eastern Indian Oceans, their fishing efforts showed a relatively lower in the southeastern part, and the catch of albacore tuna was higher than that of previous year

(Figs. 6 and 7). It seems that there are two reasons why the fishing vessels have moved southward in recent year. One is that most of fishing vessels have been apart from off the coast of Somalia which has been often infested with pirates since the mid-2000s. And the other is that Korean tuna longline fishery has targeted southern bluefin tuna in the area between 20°S and 40°S of the Indian Ocean since 1991 as it became of the highest value in Japanese sashimi market.

The temporal and spatial distributions of albacore tuna catch and CPUE by Korean longline fishery are shown that, the catch in the second half of 1970s was higher in the southwestern area than any other areas of the Indian Ocean, and CPUE was also higher in the southwestern area where was between 15°S-40°S around 30°E-65°E. In the 1980s, the catch was relatively higher in the area between 0°-15°S of the eastern and western areas, while CPUE was relatively higher in the south of 15 °S. In the 1990s, its catch and CPUE decreased dramatically. Since the second half of 2000s the catch has increased in the south of 20°S area, especially between 20°E-50°E and its CPUE has increased as well. In recent years both the catch and CPUE showed a high level in the area of southeastern area (west off Australia) as well as southwestern area (Fig. 7).

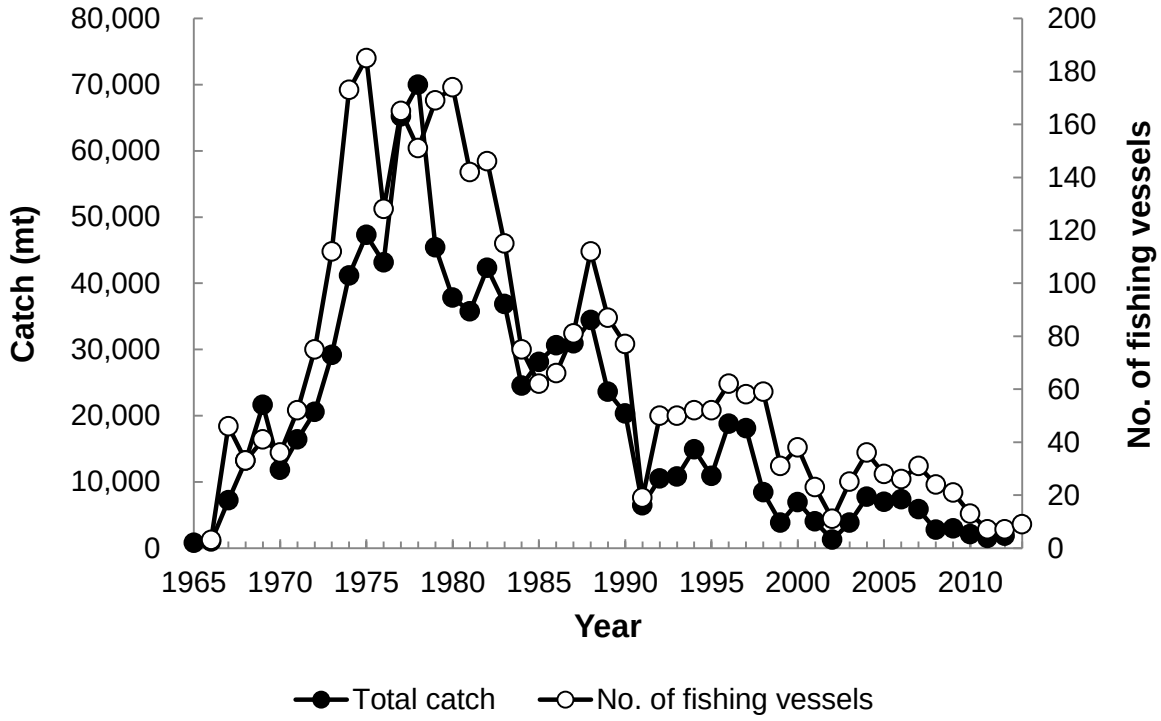

Fig. 1. Annual catch by Korean tuna longline fishery and the number of its active vessels in the Indian Ocean, 1965-2013.

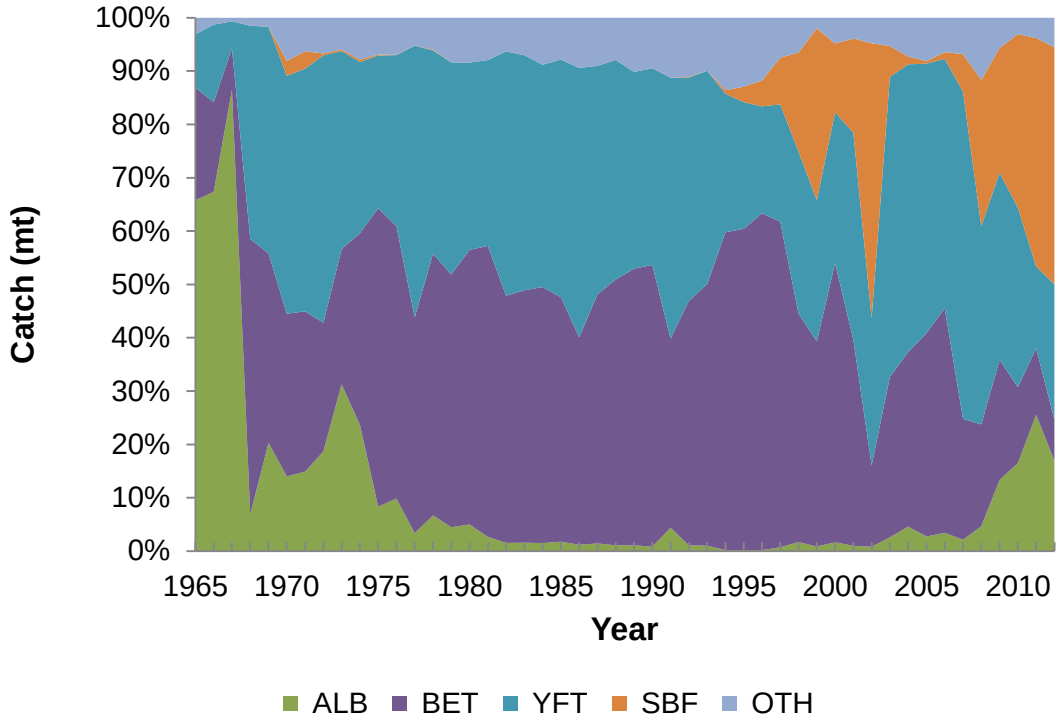

Fig. 2. Annual catch proportion by species of Korean tuna longline fishery in the Indian Ocean, 1965-2012 (Data source: IOTC database).

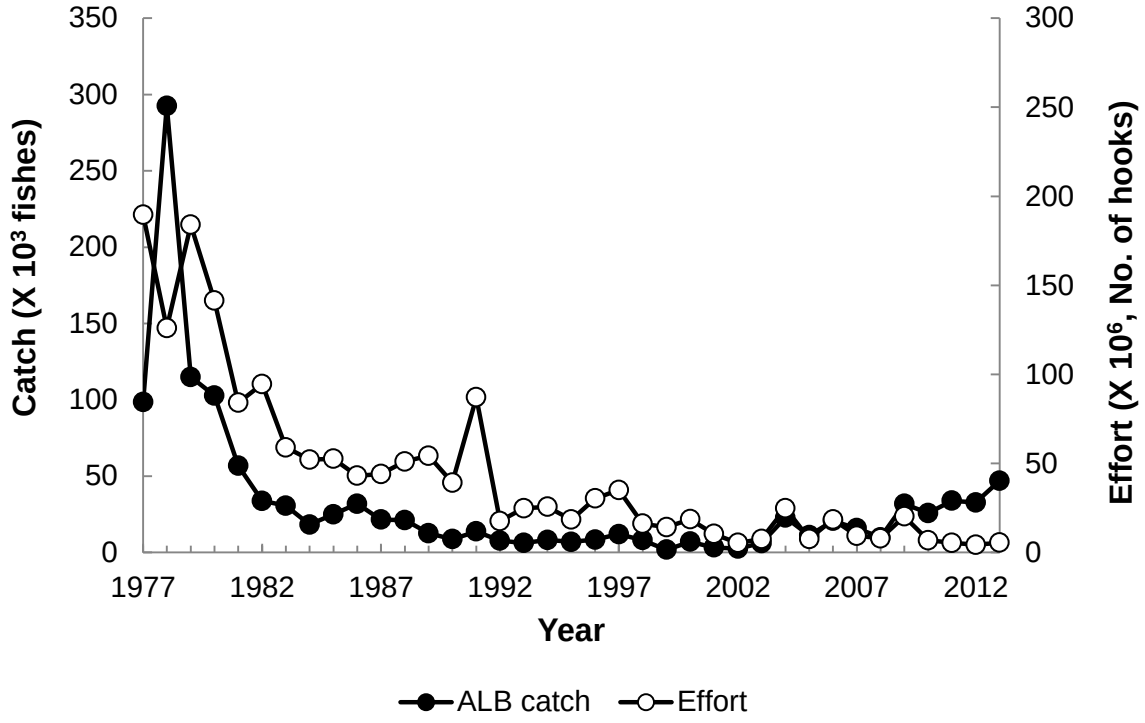

Fig. 3. Annual albacore tuna catch (in number) and fishing effort (number of hooks) by Korean tuna longline fishery in the Indian Ocean, 1977-2013 (Data source: logbook compiled from captain onboard).

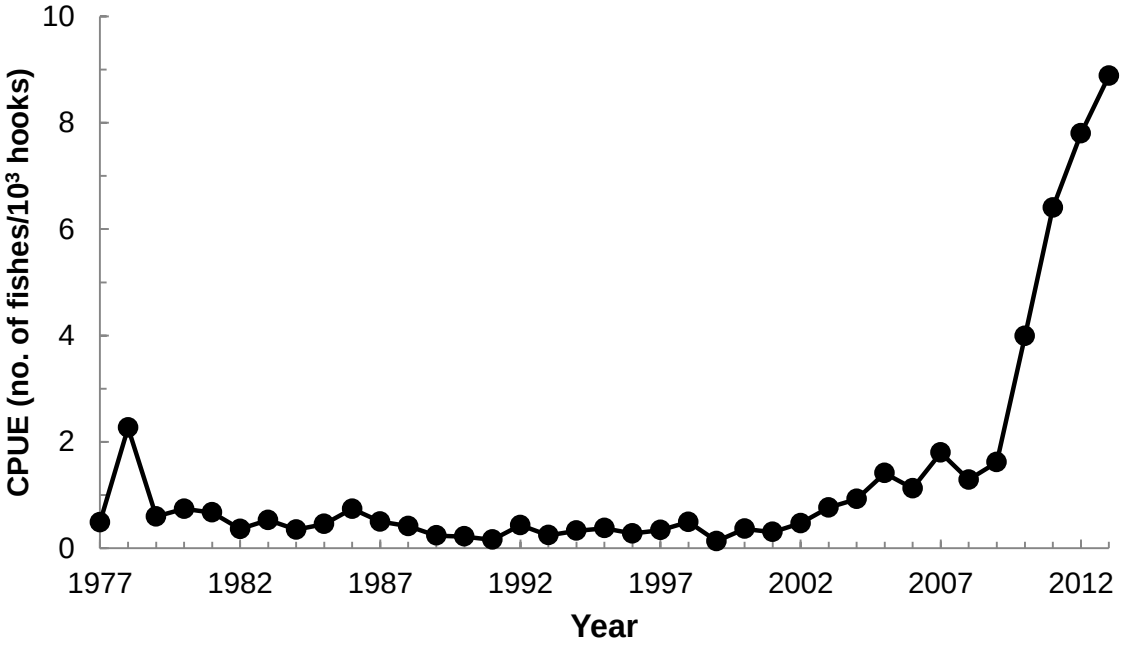

Fig. 4. Changes in the nominal CPUE of albacore tuna caught by Korean tuna longline fishery in the Indian Ocean, 1977-2013.

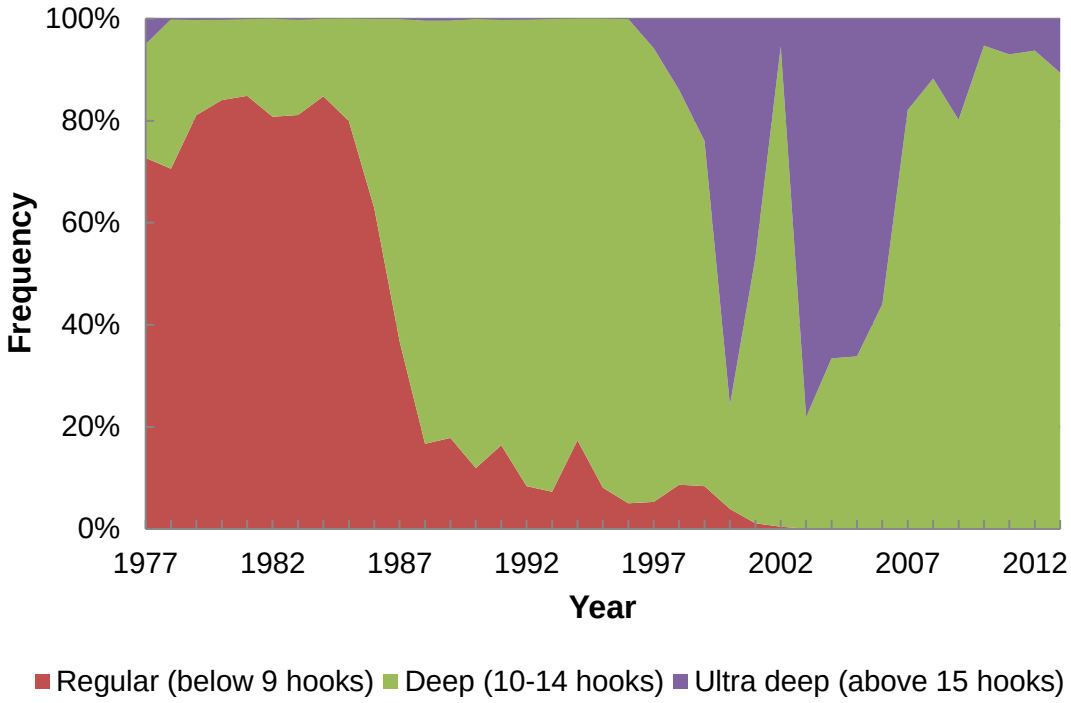

Fig. 5. Changes in the number of hooks between floats (HBF) used in Korean tuna longline fishery in the Indian Ocean, 1977-2013.

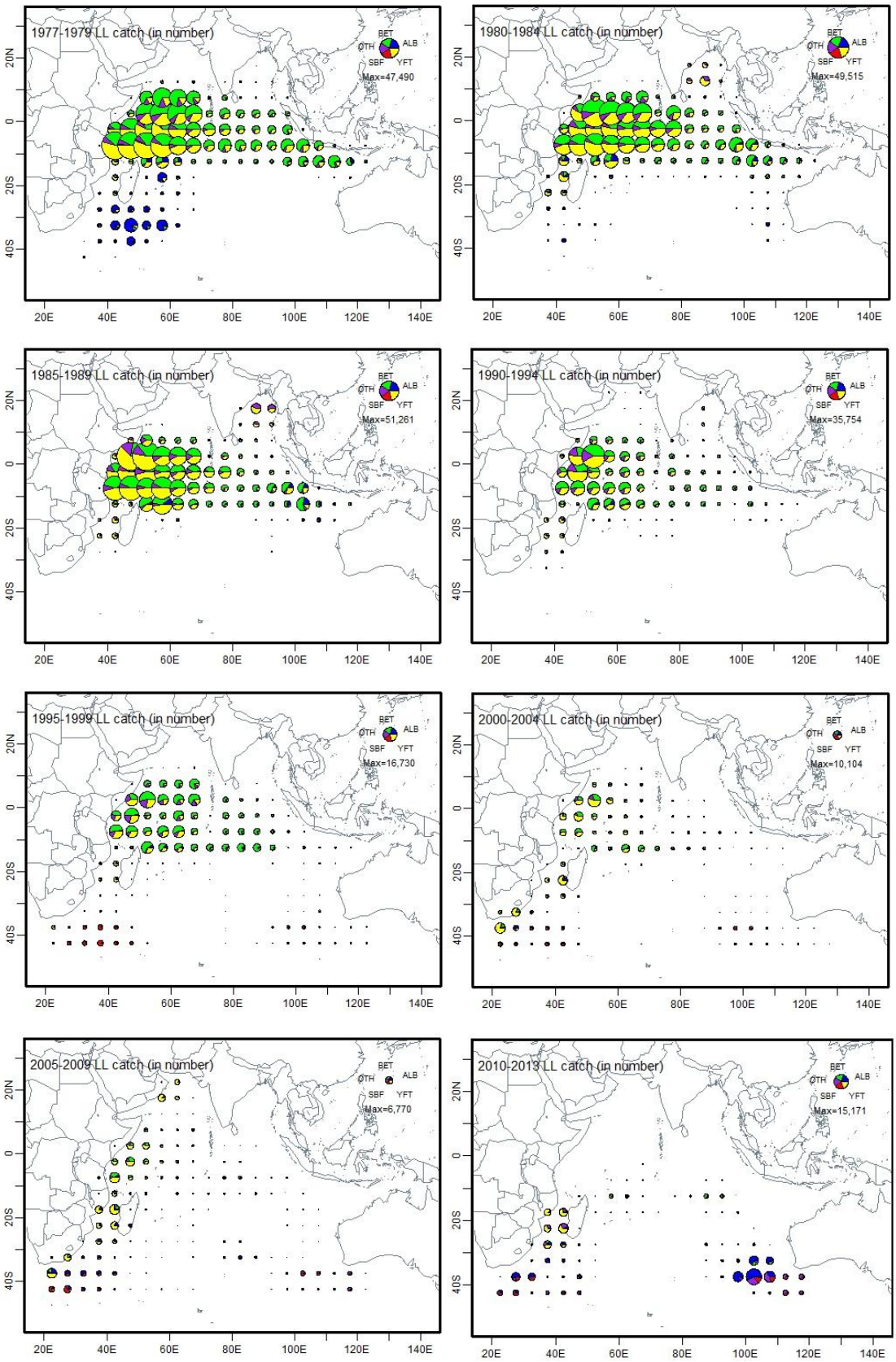

Fig. 6. The geographical distributions of catch by species caught by Korean tuna longline fishery in the Indian Ocean, 1970s-2010s.

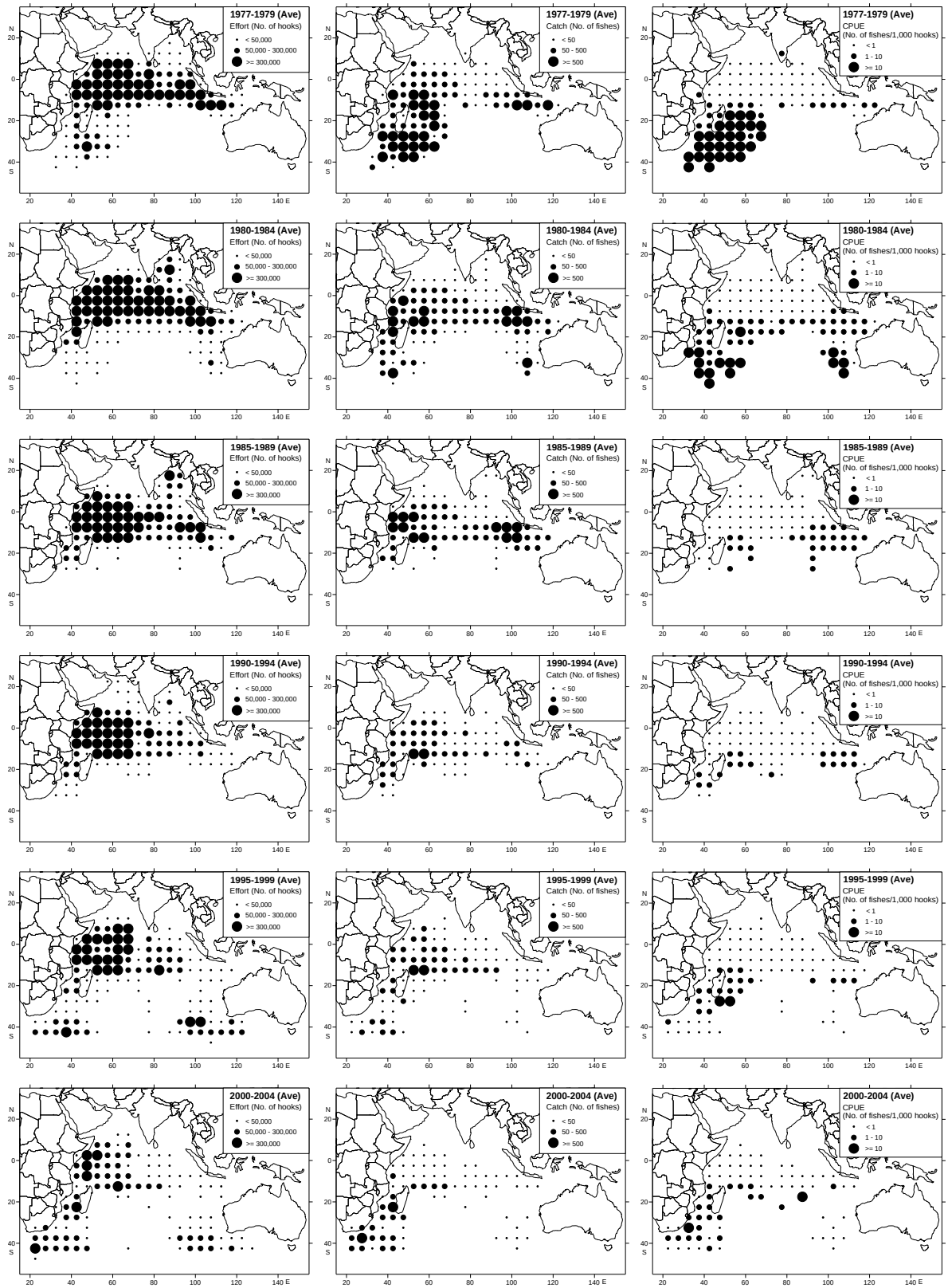

Fig. 7. The geographical distributions of effort (number of hooks), albacore catch (number of fishes), albacore CPUE (number of fishes/10^3 hooks) of Korean tuna longline fishery in the Indian Ocean, 1970s-2010s.

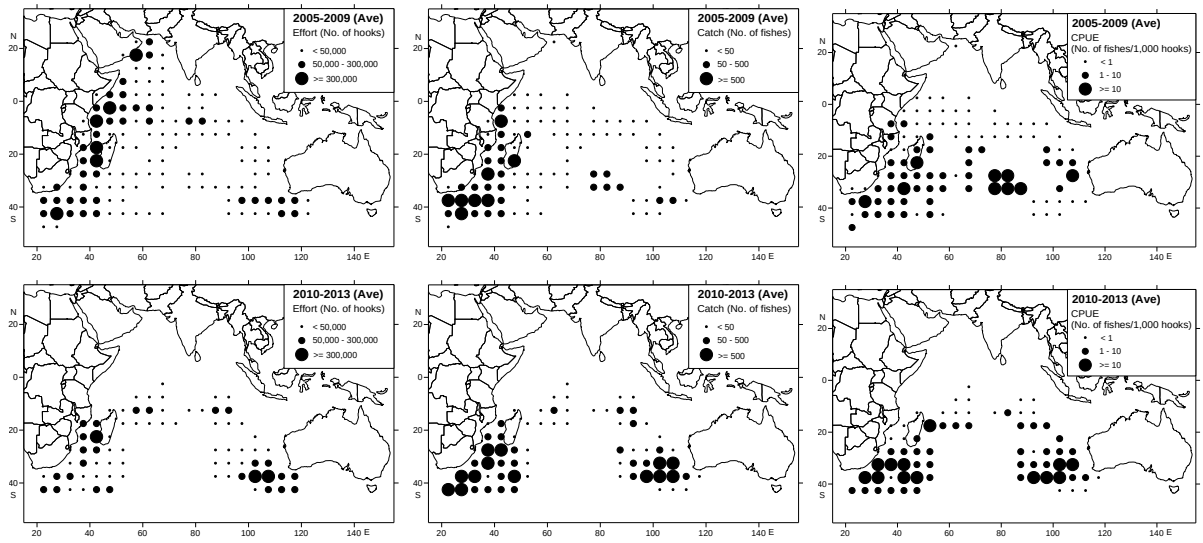

Fig. 7. Continued.

Table 1. Annual albacore tuna catch (mt) caught by Korean longline fishery in the Indian Ocean, 1965-2013

Year	Total	Western Indian Ocean	Eastern Indian Ocean
1965	526	526	
1966	647	647	
1967	6,222	6,222	
1968	908	908	
1969	4,385	4,385	
1970	1,654	1,654	
1971	2,443	2,443	
1972	3,845	3,845	
1973	9,120	9,120	
1974	9,753	9,753	
1975	3,942	3,415	527
1976	4,250	3,303	946
1977	2,188	1,712	475
1978	4,681	4,002	678
1979	2,036	1,542	494
1980	1,890	1,390	500
1981	957	851	106
1982	651	585	66
1983	582	512	70
1984	369	281	88
1985	495	269	227
1986	367	213	154
1987	444	293	151
1988	373	249	124
1989	261	219	42
1990	166	159	7
1991	283	51	232
1992	114	98	16
1993	108	101	7
1994	32	28	4
1995	19	16	3
1996	34	30	4
1997	128	127	0
1998	142	138	5
1999	32	31	1
2000	115	102	14
2001	40	39	0
2002	10	7	3
2003	100	61	39
2004	356	132	224
2005	192	144	48
2006	252	252	
2007	126	126	
2008	128	113	15
2009	396	297	99
2010	344	152	192
2011	392	341	51
2012	313	260	53
2013	582	117	465

* Data source: IOTC database. Data for 2013 is preliminary.