Review of catch and effort for albacore tuna by Korean tuna longline fishery in the Indian Ocean (1965-2017)

Sung Il Lee, Doo Nam Kim, Mi Kyung Lee and Zang Geun Kim

National Institute of Fisheries Science
216 Gijang-Haeanro, Gijang-eup, Gijang-gun, Busan 46083, Republic of Korea

Abstract

This paper describes the fishing characteristics of Korean tuna longline fishery, with a focus on catch and CPUE trends for albacore tuna in the Indian Ocean from 1965 to 2017. The number of active fishing vessels showed the highest value in the mid-1970s, after that sharply decreased to 7 vessels in 2011 and 2012, while a slight increasing to 13 or 14 vessels in recent years. The albacore tuna catch peaked at about 10 thousand ton in 1974 and sharply decreased thereafter. Since 2009 it showed an increasing over 600 ton in 2013 and 2014 but decreased again in 2016. The CPUE of albacore tuna had a big jump in the early 1970s and showed a steady trend at a low level from 1980s to the early 2000s. However, it started to increase after 2003 and sharply increased from 2011 to 2014, but again decreased in 2016. And the main fishing ground of albacore tuna by Korean longline fishery was formed between 25°S and 45°S of the western Indian Oceans off South Africa and the eastern Indian Ocean off the Western Australia.

Introduction

Korean tuna longline fishery begun with an exploratory fishing in the Indian Ocean in 1957, which was the first trial of Korean distant-water fisheries, but its catch statistics are available since the mid-1960s. The target species are yellowfin, bigeye and albacore tunas. 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 10ºN and 15ºS but shifted southward of 15ºS since 2000s for fishing for southern bluefin tuna. In recent years, its fishing ground has been formed at the area between 15ºS and 45ºS in the western area off South Africa and in the eastern area off the Western Australia.

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

Data and Methods

The nominal 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 effort (number of hooks) were compiled by the National Institute of Fisheries Science (NIFS) from the logbook submitted by captain onboard.

The annual total catch and its composition by species of Korean tuna longline fishery in the Indian Ocean were investigated using the IOTC database from 1965 to 2017. Using logbook data from 1971 to 2017, the CPUEs of albacore tuna were calculated from the catch and effort data, and the fishing characteristics were analyzed by decade and by area (5°x5° block).

Results and Discussion

Total catch of tuna and tuna-like species by Korean longline fishery in the Indian Ocean steeply increased from the mid-1960s to 1978 when it peaked at about 70 thousand ton, and showed a sharp-stepwise decreasing with a fluctuation thereafter (Fig. 1). The number of active fishing vessels of Korean longline tuna fishery recorded the highest value of 185 vessels in the 1975, since then until the early 2000s it sharply decreased, because of unfavorable fishing conditions, and further to 7 vessels in 2011 and 2012 due to piracy activities. However, it is showing a slight increasing to 13 or 14 vessels in recent years (Fig.

1). Catch trend was generally consistent with the number of vessels active from the beginning to the recent years.

As for the annual catch proportion by species (Fig 2), albacore tuna, along with bigeye and yellowfin tunas, was a target species which accounted for above 15% in the proportion until 1974, and then it decreased dramatically while bigeye and yellowfin tunas were main target species which accounted for above 70% until 2007, except 2002 when the catch of southern bluefin tuna was relatively high. After 2008 the catch proportion of southern bluefin tuna increased to about 20-40%, and that of albacore tuna also increased to 20% in average.

For the annual catch of albacore tuna, it had increased from the mid-1960s to 1974 when recorded the highest catch of about 10 thousand ton, after that it sharply decreased to below 10 ton in the early 1990s. During the 1990s, it had remained at low level of below 200 ton, and increased after 2009 and showed over 600 ton in 2013 and 2014, but again decreased in 2016 (Table 1).

The fishing effort of Korean tuna longline fishery had shown a high level of over 10 million hooks from 1978 to 1990, but since then it has decreased and showed a level of 5-7 million hooks in recent years (Fig. 3). The CPUE of albacore tuna had a big jump in the early 1970s and showed a steady trend from 1980s to the early 2000s. However, it started to increase after 2003 and sharply increased from 2011 to 2014, but again decreased in 2016 (Fig. 4).

In the decadal geographical distributions of catch by main species (albacore, bigeye and yellowfin tuna) caught by Korean tuna longline fishery in the Indian Ocean from 1970 to 2017, the fishing efforts were concentrated at the tropical area between 10^{o}N-15^{o}S of the western Indian Ocean during the period from 1970s to 1990s, which targeted bigeye and yellowfin tunas (Fig. 5). In 1970s, there were fishing efforts for albacore tuna in the western area around 20^{o}S-40^{o}S. However, there were few fishing efforts at south of 25^{o}S in 1980s, and since 1990s some fishing vessels moved southward to fish for southern bluefin tuna in the western and eastern Indian Oceans around 35^{o}S-45^{o}S. In 2010s, most of fishing vessels operated at the south of 20^{o}S in the western and eastern Indian Oceans to fish for southern bluefin tuna or albacore tuna, but the target species was different depending on the fishing conditions (Figs. 5 and 6).

The temporal and spatial distributions of total effort, and the catch and CPUE of albacore tuna by Korean longline fishery are shown in Fig. 6. In 1970s, albacore tuna catch was higher in the south-western area of the Indian Ocean, and the CPUE was also higher in the south-

western area where was between 25ºS-45ºS around 30ºE-75ºE. In the 1980s, the albacore tuna catch was relatively higher in the area between 0º-20ºS of the eastern and western areas, and the CPUE was relatively higher in the south-western area same as the 1970s. In the 1990s, the albacore tuna CPUE were relatively lower, but in the 2000s it increased at the south of 25ºS and was high particularly in the eastern Indian Ocean off the Western Australia (Fig. 6).

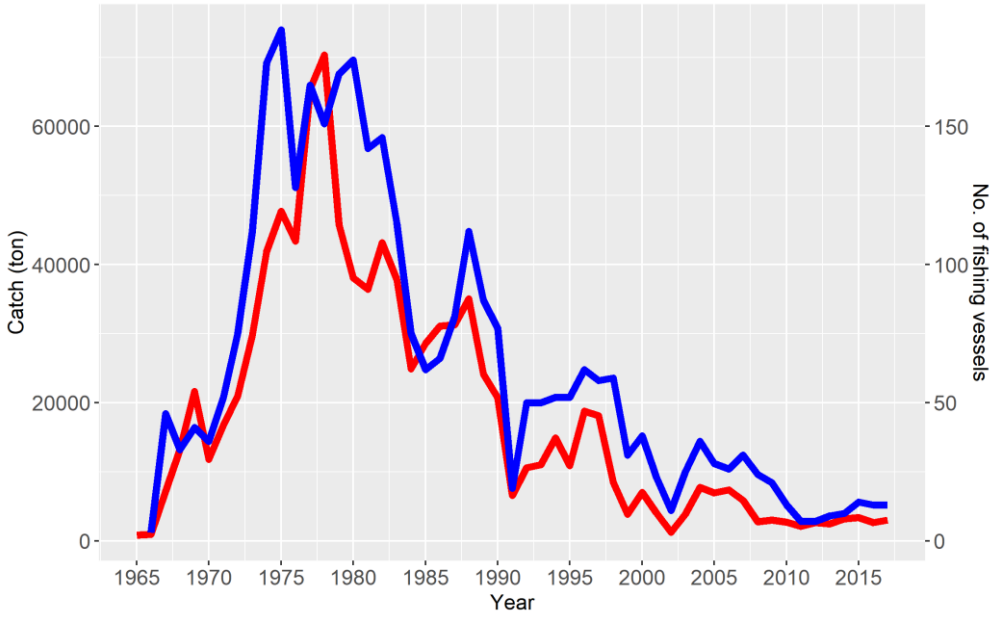

Fig. 1. Annual total catch (red line) by Korean tuna longline fishery and the number of its active vessel (blue line) in the Indian Ocean, 1965-2017.

Fig. 2. Annual catch proportion by species of Korean tuna longline fishery in the Indian Ocean, 1965-2017 (Data source: IOTC database).

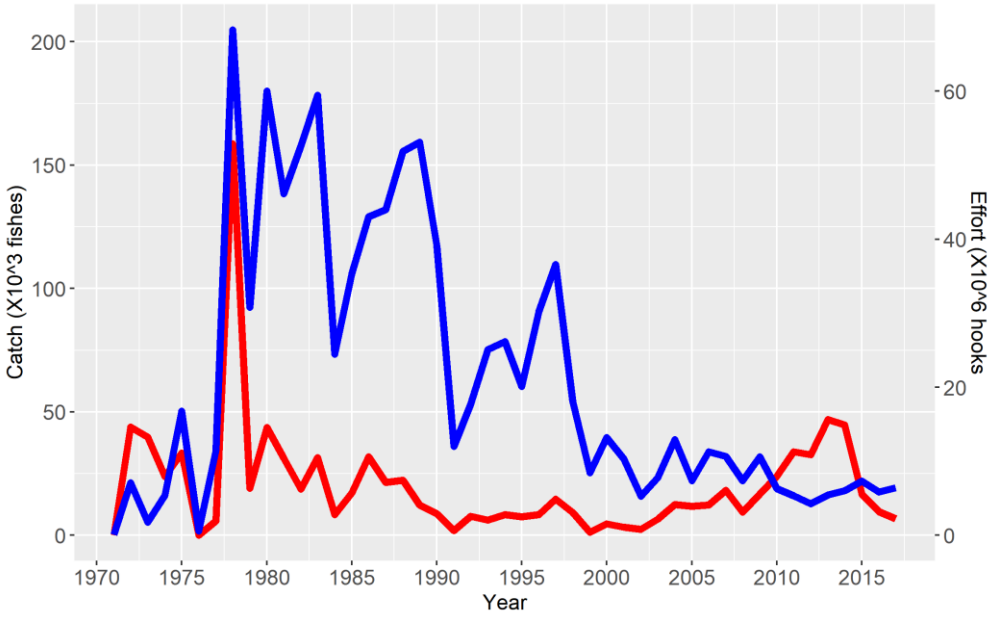

Fig. 3. Annual albacore tuna catch (red line) and fishing effort (blue line) by Korean tuna longline fishery in the Indian Ocean, 1971-2017 (Data source: logbook compiled from captain onboard).

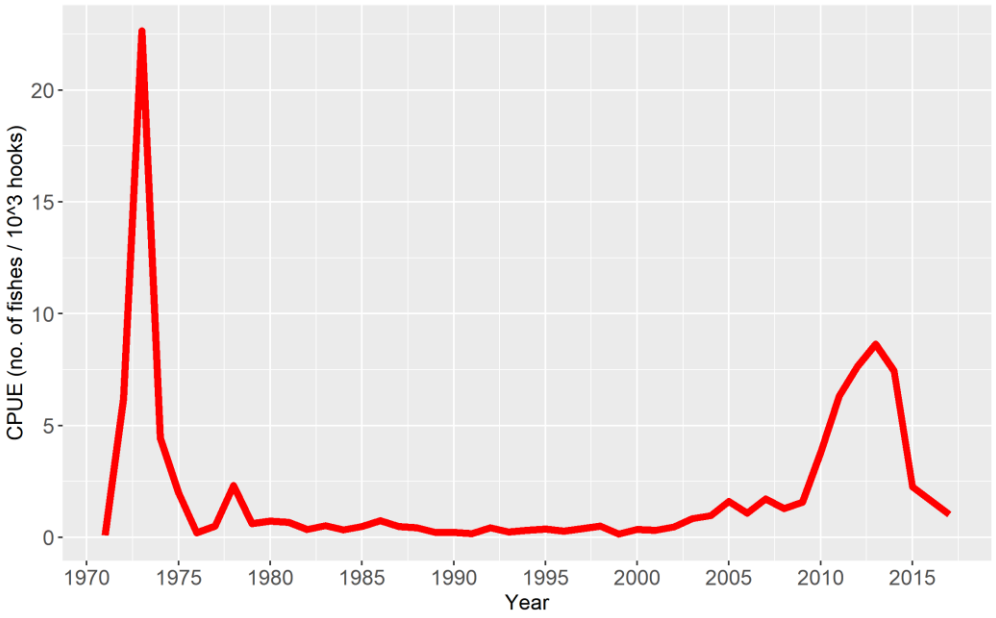

Fig. 4. Changes in the nominal CPUE of albacore tuna caught by Korean tuna longline fishery in the Indian Ocean, 1971-2017.

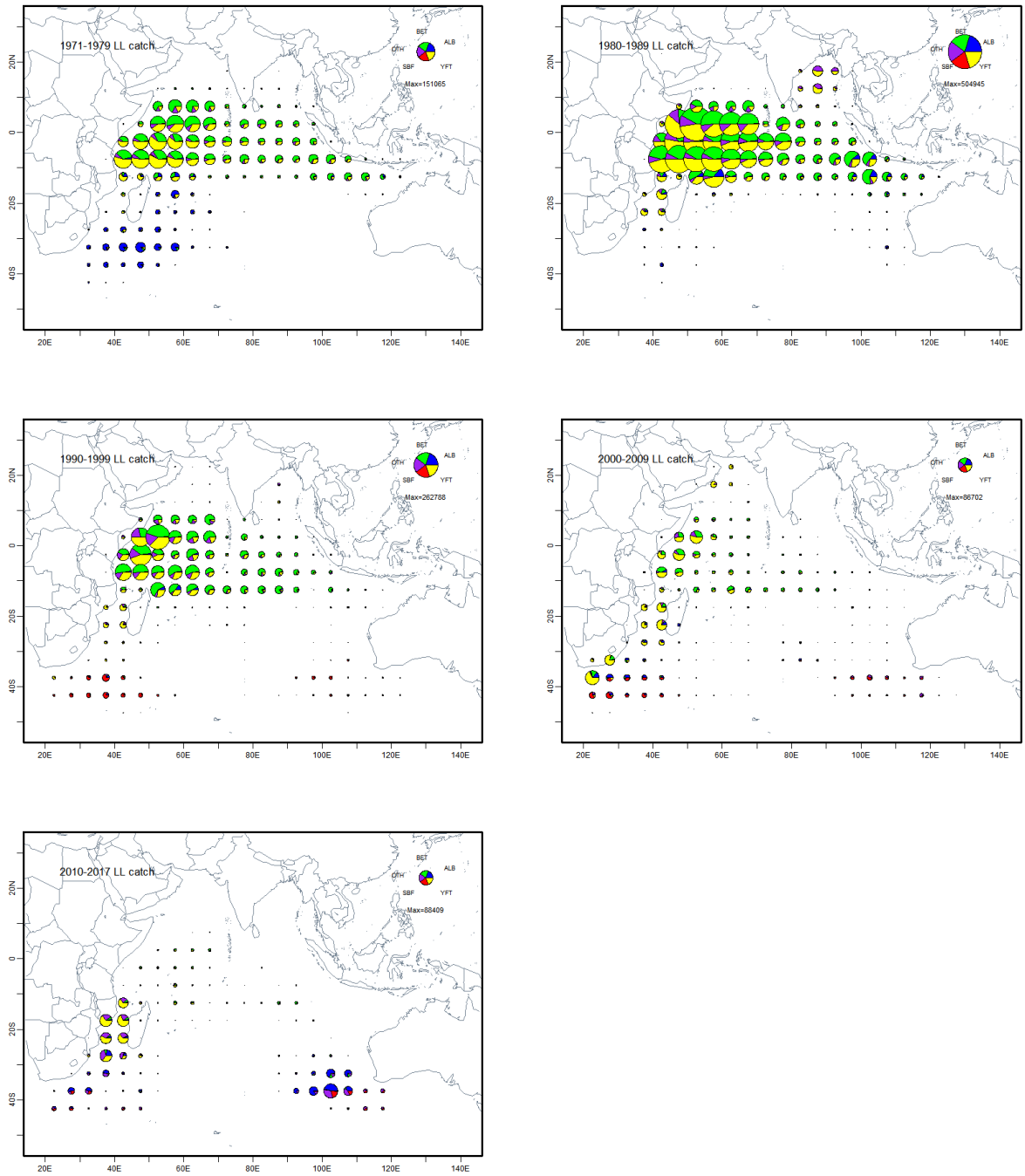

Fig. 5. The geographical distributions of catch by main species caught by Korean tuna longline fishery in the Indian Ocean, 1970s-2010s.

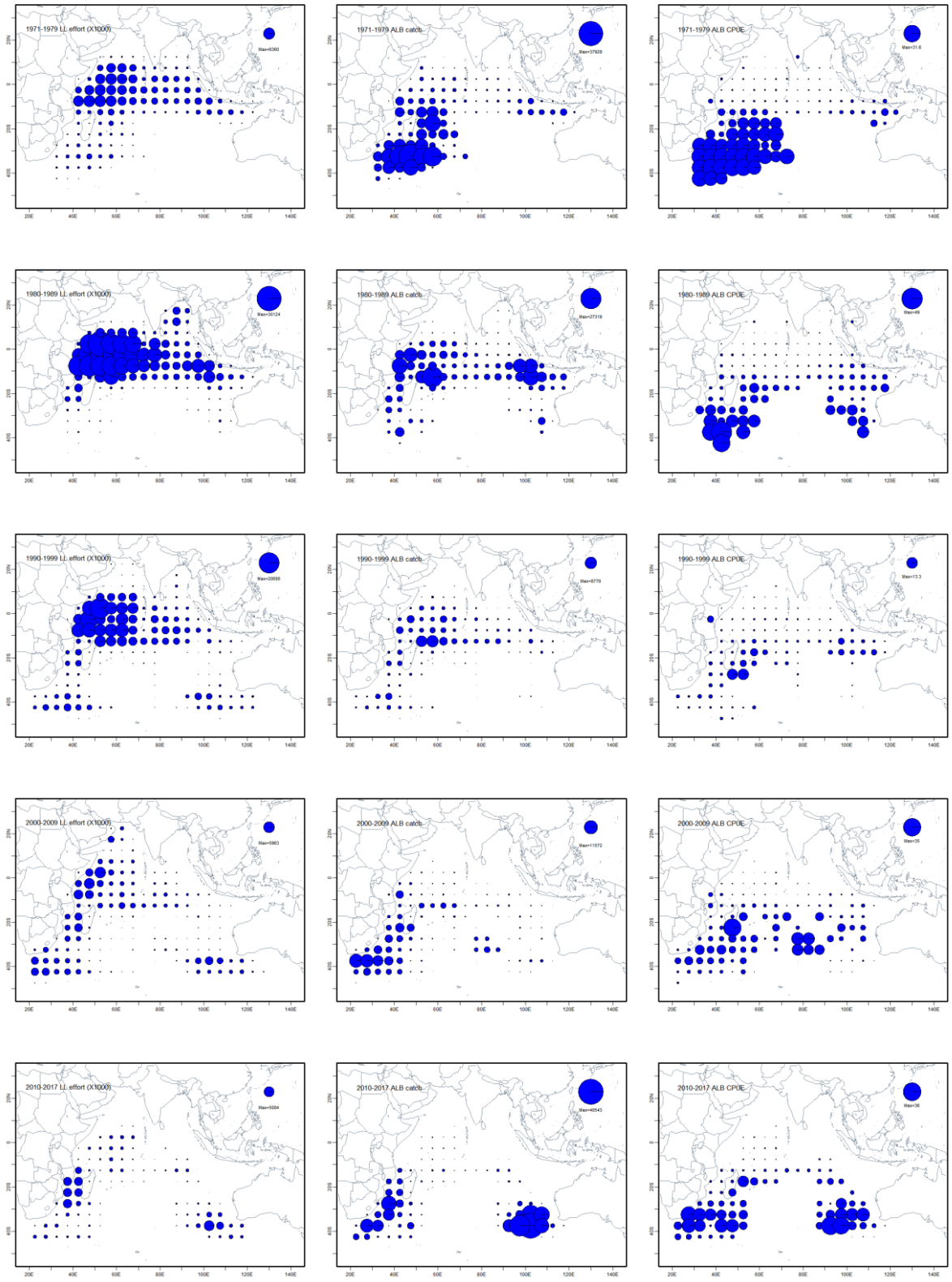

Fig. 6. The geographical distributions of total effort (number of hooks), catch (number of fishes), and CPUE (number of fishes/10^3 hooks) of albacore tuna by Korean tuna longline fishery in the Indian Ocean, 1970s-2010s.

Table 1. Annual albacore tuna catch (ton) caught by Korean longline fishery in the Indian Ocean, 1965-2017

Year	West	East	Total
1965	556	0	556
1966	717	0	717
1967	6,543	0	6,543
1968	792	0	792
1969	4,631	0	4,631
1970	1,735	0	1,735
1971	2,531	0	2,531
1972	3,980	0	3,980
1973	9,615	0	9,615
1974	10,322	0	10,322
1975	3,303	346	3,649
1976	3,302	829	4,131
1977	1,311	323	1,634
1978	3,844	530	4,374
1979	1,512	447	1,959
1980	1,305	373	1,678
1981	690	58	748
1982	368	50	418
1983	236	56	292
1984	181	82	263
1985	105	226	331
1986	25	150	175
1987	86	144	230
1988	12	108	120
1989	29	29	58
1991	0	234	234
1992	0	6	6
1993	5	0	5
1994	28	4	32
1995	16	3	19
1996	30	4	34
1997	127	0	127
1998	138	5	143
1999	31	1	32
2000	102	14	116
2001	39	0	39
2002	7	3	10
2003	61	39	100
2004	132	224	356
2005	144	48	192
2006	252	0	252
2007	126	0	126
2008	113	32	145
2009	301	84	385
2010	152	192	344
2011	341	51	392
2012	260	53	313
2013	121	492	613
2014	107	536	643
2015	215	94	309
2016	194	9	203
2017	139	0	139