Catch and size data of striped marlin (*Kajikia audax*) caught by the Taiwanese fisheries in the Western and Central North Pacific Ocean during 1958-2020

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Abstract

Catch and size data of striped marlin caught by the Taiwanese fisheries in Western and Central North Pacific Ocean (WCNPO) during 1958-2020 and 1981-2020, respectively, were summarized for the 2022 ISC striped marlin stock assessment. Total catches fluctuated about 600 metric tons from 1950 to 1991, then declined gradually until 2001 at 201 metric tons, and increased sharply at 896 metric tons in 2003. After then, the total catches declined again until 2014 at 202 metric tons. The total catches have stabilized at about 400 metric tons in the past four years. Size data collected by the Taiwanese distant-water longline fishery revealed a relatively stable trend from 2004 to 2020. For the consistency of the data format used in the stock assessment, lower-jaw-to-fork length (LJFL) was converted into eye-to-fork length (EFL) as the input data of the stock assessment model.

Introduction

The catch and size data of striped marlin (*Kajikia audax*) recorded by Taiwanese fisheries within WCNPO were last updated to 2017. This working paper reviews and updates the catches from various fisheries and size data from the distant-water longline fishery up to 2020.

Materials and methods

Catch data of striped marlin, provided by the Oversea Fisheries Development Council (OFDC) of Taiwan, was grouped into three fishery classifications: distant-water tuna longline (DWLL), small-scale tuna longline (STLL), and others (coastal longline, offshore gillnet, coastal gillnet, catches from offshore, other coastal fisheries, and unknown). Time-series of the catch data were summarized. Vessels equal to or larger than 100 GRT were classified as DWLL fishing vessels, and vessels with GRT smaller than 100 (mostly 50-70) were classified as STLL fishing vessels.

Lower jaw-to-fork length (LJFL) (cm) of striped marlin from Taiwanese DWLL fishery in WCPNO (first 30 fishes caught each set) were summarized. For the consistency of data format used in the stock assessment, LJFL was converted into eye-to-fork length (EFL) using the equation described by Hsu (2010):

$$LJFL = 1.12 \times EFL + 7.33$$

Results and discussions

Striped marlin catches by the Taiwanese fisheries in WCNPO were summarized in **Table 1**. Total catches fluctuated about 600 metric tons from 1958 to 1991, then declined gradually until 2001 at 201 metric tons, and increased sharply at 896 metric tons in 2003 (**Fig. 1**). After then, the total catches declined again until 2014 at 202 metric tons. The total catches have stabilized at about 400 metric tons in the past four years. As presented in **Table 1**, the majority of stripe marlin catch in WCNPO has been caught by the STLL fishery, and the DWLL fishery contributes less to the historical catches.

Summary and composition of fish body length in LJFL recorded by the DWLL fishery in WCNPO were shown in **Table 2** and **Fig. 2a**. The converted EFL were displayed in **Table 3** and **Fig. 2b**. While with higher variation in early years, the fish body length was relatively stable from 2004 to 2020. It was noted that the data quality has been improved since 2004, therefore we recommend using fish body length data from 2004-2020 as the input data for the stock assessment.

References

Hsu, W. C. (2010). Age and growth of striped marlin (*Kajikia audax*) in waters off Taiwan. MS. Thesis, National Taiwan University, Taipei, Taiwan. 104 pp. [In Chinese.]

Table 1. Catch estimates (in metric ton) of striped marlin caught by the fisheries of Taiwan in the western and central North Pacific Ocean (WCNPO) during 1958-2020. DWLL= distant-water tuna longline; STLL= small scale tuna longline; Others = coastal longline, offshore gillnet, coastal gillnet, and catches from offshore and coastal other fisheries or unknown.

Year	DWLL	STLL	Others	Total	Year	DWLL	STLL	Others	Total
1958		543	387.4	930.4	1990	2	137	256	395
1959		391	353.5	744.5	1991	36	254	286	576
1960		398	350.4	748.4	1992	1	219	197	417
1961		306	342	648	1993	5	221	142	368
1962		332	211.1	543.1	1994	1	137	196	334
1963		560	199	759	1995	27	83	82	192
1964		392	174.8	566.8	1996	26	162	47	235
1965		355	156.8	511.8	1997	59	290	47	396
1966		370	180.4	550.4	1998	90	205	50	345
1967	2	385	204	591	1999	66	128	42	236
1968	1	332	208	541	2000	90	161	55	306
1969	2	571	192	765	2001	21	129	51	201
1970	0	495	189	684	2002	51	226	29	306
1971	0	449	135	584	2003	172	681	43	896
1972	9	380	126	515	2004	228	261	24	513
1973	1	568	139	708	2005	176	584	32	792
1974	24	650	117.5	791.5	2006	134	537	147	818
1975	64	732	96	892	2007	89	199	170	458
1976	32	347	140	519	2008	72	192	213	477
1977	17	524	219	760	2009	30	225	138	393
1978	0	618	78	696	2010	32	200	176	408
1979	26	432	122	580	2011	53	269	127	449
1980	61	223	131.5	415.5	2012	73	352	150	575
1981	16	491	95	602	2013	67	285	220	572
1982	7	397	138	542	2014	16.8	115	69.8	201.6
1983	0	555	214	769	2015	33.3	181	32.9	247.2
1984	0	965	330	1295	2016	58	135	24.3	217.3
1985	0	513	181	694	2017	72	291	48.3	411.3
1986	0	179	148	327	2018	54	259	32.8	345.8
1987	31	383	151	565	2019	39	314	33.9	386.9
1988	7	457	169	633	2020	31.5	307	33.4	371.9
1989	6	184	157	347					

Table 2. Summary of length data (LJFL, cm) collected by Taiwanese distant-water longline fishery in Western and Central North Pacific Ocean (WCNPO) from 1981-2020.

Year	Median	Mean	Min	Max	Sample size
1981	170	165.88	120	256	216
1982	212.5	213.95	160	285	94
1983					0
1984	252	252.5	238	270	8
1985					0
1986					0
1987					0
1988					0
1989	178	175.5	124	192	14
1990	130	145.1	50	239	121
1991	150	149.43	140	156	7
1992					0
1993	251	245.6	230	251	5
1994					0
1995	140	139.33	129	146	45
1996	136	136.53	73	210	32
1997	132	133.67	97	162	396
1998	98.5	98.5	72	125	2
1999	113.5	113.13	89	127	16
2000	111	105.08	65	127	24
2001	196	207.83	152	295	6
2002	136	144.31	100	243	96
2003	155.5	158.88	102	284	16
2004	156	154.2	60	241	1245
2005	169	164.56	62	275	1072
2006	178	177.10	90	260	324
2007	165	167.57	87	231	276
2008	165.5	163.29	82	232	282
2009	156.5	159.11	75	210	152
2010	155.5	158.89	122	280	282
2011	166	163.17	71	248	390
2012	165	164.5	93	253	882
2013	171	169.87	112	247	382
2014	171.5	170.88	87	228	102
2015	166	167.39	114	238	145
2016	172	169.34	110	222	128
2017	162	165.16	110	237	229
2018	174	167.74	95	244	162
2019	151	157.98	96	250	217
2020	172	169.08	128	265	150

Table 3. Summary of length data (LJFL-converted EFL, cm) collected by Taiwanese distant-water longline fishery in the Western and Central North Pacific Ocean (WCNPO) from 1981-2020.

Year	Median	Mean	Min	Max	Sample size
1981	145.24	141.57	100.60	222.03	216
1982	183.19	184.48	136.31	247.92	94
1983					0
1984	218.46	218.90	205.96	234.53	8
1985					0
1986					0
1987					0
1988					0
1989	152.38	150.15	104.17	164.88	14
1990	109.53	123.01	38.10	206.85	121
1991	127.38	126.87	118.46	132.74	7
1992					0
1993	217.56	212.74	198.81	217.56	5
1994					0
1995	118.46	117.86	108.63	123.81	45
1996	114.88	115.36	58.63	180.96	32
1997	111.31	112.81	80.06	138.10	396
1998	81.40	81.40	57.74	105.06	2
1999	94.79	94.46	72.92	106.85	16
2000	92.56	87.28	51.49	106.85	24
2001	168.46	179.02	129.17	256.85	6
2002	114.88	122.31	82.74	210.42	96
2003	132.29	135.31	84.53	247.03	16
2004	132.74	131.13	47.03	208.63	1245
2005	144.35	140.38	48.81	238.99	1072
2006	152.38	151.58	73.81	225.60	324
2007	140.78	143.07	71.13	199.71	276
2008	141.22	139.25	66.67	200.60	282
2009	133.19	135.52	60.42	180.96	152
2010	132.29	135.32	102.38	243.46	282
2011	141.67	139.14	56.85	214.88	390
2012	140.78	140.33	76.49	219.35	882
2013	146.13	145.13	93.46	213.99	382
2014	146.58	146.03	71.13	197.03	102
2015	141.67	142.91	95.24	205.96	145
2016	147.03	144.65	91.67	191.67	128
2017	138.10	140.92	91.67	205.06	229
2018	148.81	143.22	78.28	211.31	162
2019	128.28	134.51	79.17	216.67	217
2020	147.03	144.42	107.74	230.06	150

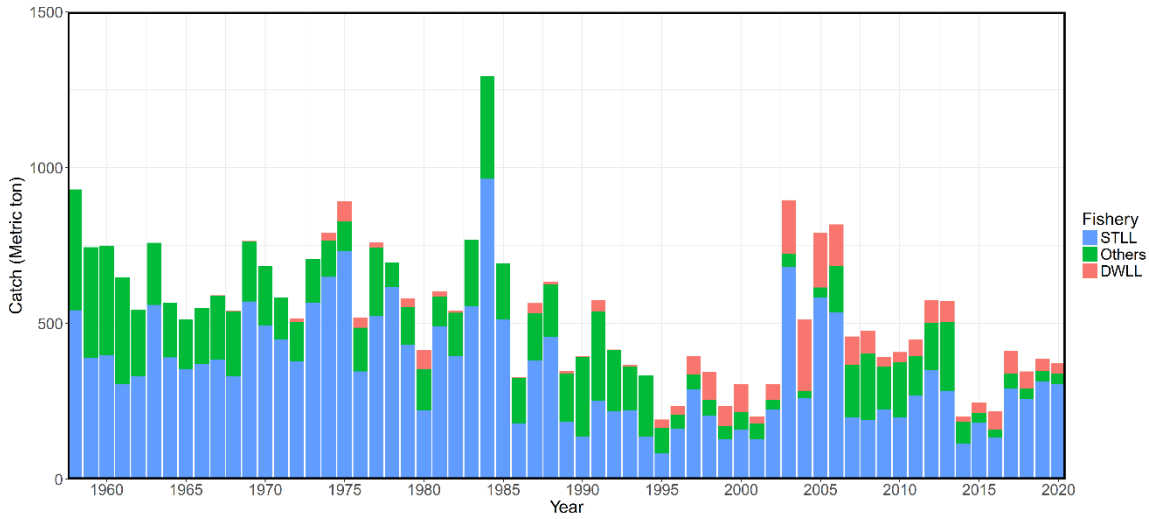

Figure 1. Time-series of striped marlin catches caught by the fisheries of Taiwan in the western central North Pacific Ocean (WCNPO) during 1958-2020. DWLL= distant-water tuna longline; STLL= small scale tuna longline; Others = coastal longline, offshore gillnet, coastal gillnet, and catches from offshore and coastal other fisheries or unknown.

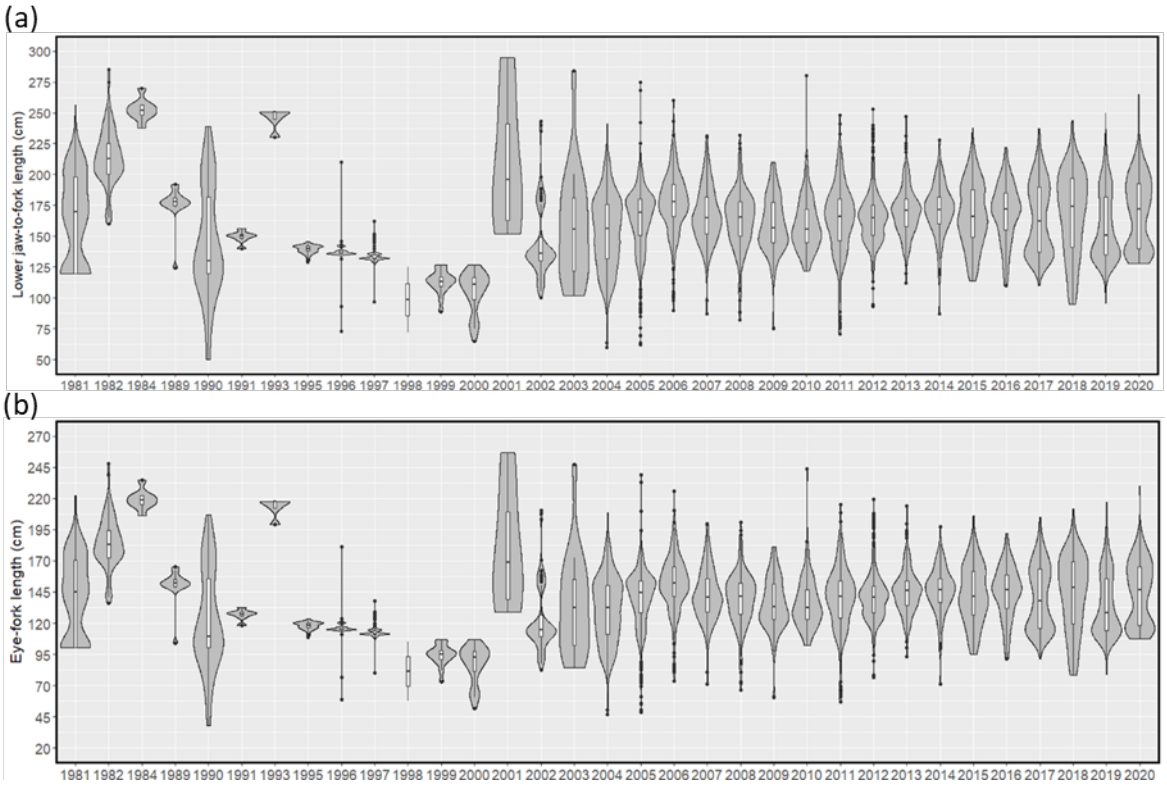

Figure 2. (a) Lower jaw-to-fork length and (b) converted eye-to-fork length distributions of striped marlin caught by the Taiwanese distant-water longline fishery in the western central North Pacific Ocean (WCNPO) during 1981-2020.