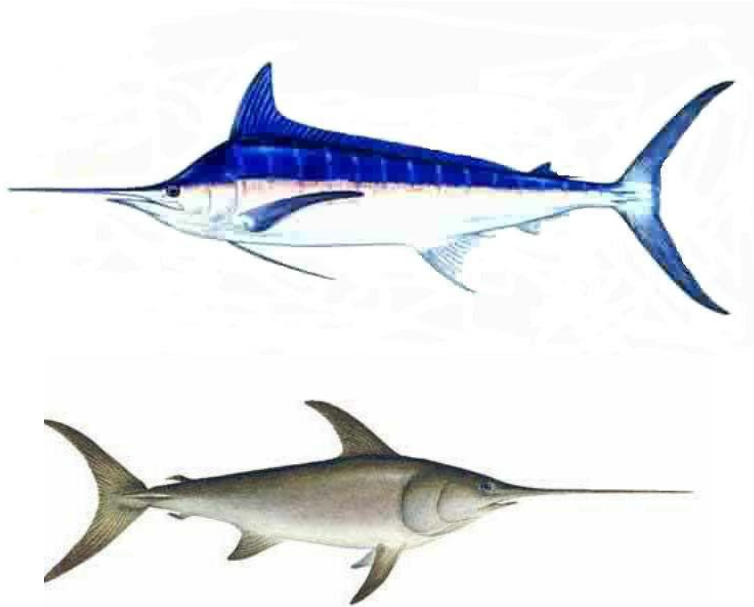




Input Data of Blue Marlin Caught by Japanese Fisheries for the Stock Assessment in the Pacific Ocean¹

Ai Kimoto and Kotaro Yokawa
National Research Institute of Far Seas Fisheries
Shimizu, Shizuoka, Japan



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INPUT DATA OF BLUE MARLIN CAUGHT BY JAPANESE FISHERIES FOR THE STOCK ASSESSMENT IN THE PACIFIC OCEAN

Ai Kimoto and Kotaro Yokawa

National Research Institute of Far Seas Fisheries (NRIFSF)

Abstract

This report provides input data of catch amount and size of blue marlin caught by Japanese fisheries up to 2011 for the stock assessment. The catch amount by fishing gear was provided using Japanese year book and logbook data between 1971 and 2011. There were several gear types: Japanese offshore and distant-water longline, coastal longline, other longline, squid drift net, drift net, bait fishing, net fishing, trap net, and others-primarily harpoon. The size data were also updated and provided for several fisheries in this report, and blue marlin were mainly measured for distant-water longline.

Introduction

This report provides input data of catch amount and size data of blue marlin caught by Japanese fisheries for the stock assessment. The ISC Billfish Working Group decided to conduct the stock assessment of blue marlin in the Pacific Ocean through the cooperations with IATTC and WCPFC.

Blue marlin historically have been caught by several fisheries; Japanese distant-water and offshore longline, coastal longline, other longline, squid drift net, drift net, bait fishing, trap net, and others (primarily harpoon and trolling). The catch amount was compiled by Japanese logbooks and year books since 1971. Our previous study (Kimoto and Yokawa, 2012a) pointed out that the longline log-book data in early period possibly contained problems on the identification of marlins, and the catch data in the year books, which are the source of the annual catch estimates of fisheries other than offshore, distant-water and coastal longline fisheries (i.e. fisheries without mandate log-book reporting system), were reported as "blue marlins" which contains both blue and black marlin. Thus, this document provided Japanese historical catch information of blue marlin caught by fishery in the period between 1971 and 2011, also provided the updated size data up to 2011 from the previous study (Kimoto and Yokawa, 2012b).

Material and Method

Various types of data were used to calculate the catch of Japanese distant-water and offshore longline. Historical total catch in number and in weight of blue marlin in the period between 1971 and 2011 were obtained from the logbook of the Japanese distant-water longline fishery compiled by National Research Institute of Far Seas Fisheries (NRIFSF). The catch in number by training vessels between 1973 and 1993 was also used, which had separate log-book reporting system from those of commercial boats in this period. These data are aggregated by month, and 5x5 degree grids.

Japanese catch amount in metric ton by distant-water and offshore longline between 1971 and 2011 using 5x5 aggregated logbook data. Due to the lack of the weight data of the catch weight by training vessels in between 1973 and 1993, they were estimated in the way of multiplying the catch number data by the average weight by area and quarter. For this purpose, four areas were designated as follows: North Temperate, North Tropical, South Tropical and South Temperate areas (Figure 1-a, abbreviation; NTemp, NTrop, STrop, and STemp, respectively).

Historical Japanese coastal longline (defined as the longline boat of 10 – 19.99 tons) catch was calculated from Japanese year book and logbook data. Catch amount between 1994 and 2011 was estimated using the logbook of Japanese coastal longline which have been collected since 1994 by Japan Fishery Agency and compiled by NRIFSF. For the catch before 1993, Japanese year book data which has species combined catch weight information of blue and black marlins under the name of "blue marlins" were used as the base information for the annual catch estimation of blue marlin. The average ratio of catch of blue marlin in weight to the sum of blue and black marlin catch in weight in the period between 1994 and 1998 from the logbooks was used to apportion the "blue marlins" catch weight in the year book to species specific weights.

The catch amount by other gear types: Japanese other longline, squid drift net, drift net, bait fishing, net fishing, trap net, and others (primarily harpoon and trolling), were also estimated from "blue marlins" catch weight information in the Japanese year books since 1971. To apportion the "blue marlins" catches into blue marlin and black marlin values, the species and the fishery type specific landing data collected at several major fishing ports by the Research Project on Japanese bluefin tuna (RJB) since 2005 were also used. The average ratio of catch of blue marlin in weight to the sum of blue and black marlin catch in weight in between 2005 and 2010 from the RJB data was used to apportion the total annual catch from the year book.

Size data of blue marlin by each fishery were updated up to 2011 from our previous study (Kimoto and Yokawa, 2012b). NRIFSF has collected and compiled size data, in eye fork length (EFL, cm) or processed weight (kg) of blue marlin caught in the entire Pacific Ocean by various Japanese fisheries since 1970s. Size data of blue marlin by each fishery were measured

on boat, or at fishing ports in Katsuura, Kesenuma, Yaizu, Tokyo, Shimizu, and Kagoshima. In this document, a total of 770,000 measured size data of blue marlin caught mainly by distant-water, offshore, and shallow-setting longline fisheries, and drift net were used for the analysis.

Results

The catch of blue marlin caught by Japanese distant-water and offshore longline including the catch by training vessels was estimated by quarter in the period between 1971 and 2011 (Table 1, Figure 2). Figure 3 shows that the average weight of blue marlin by area and quarter in the period between 1973 and 1993 to estimate the catch by training vessels. The estimated total catch in the period between 1970s and 1990s was about 10,000 metric ton. The catch was decreased significantly in the late 1990s with the depletion of effort of Japanese distant-water longline, and the catch in 2011 was less than 2,000 metric ton. The quarterly catch have been similar between years, and the ratio of the catch in each quarter was about 30, 30, 20, and 20 percentage for the 1st, the 2nd, the 3rd and the 4th quarter, respectively.

The catch by coastal longline and the other fisheries were compiled in Table 2. The coastal longline catch was increased since 1971 and was reached the largest catch in the mid-1990s. Afterwards, the catch was significantly dropped and was fluctuated between 1,000 and 1,500 metric ton. The catch by bait fishing was about 600 metric ton in the recent years, which was the largest catch among the rest of the other fisheries.

The calculated ratio of catch of blue marlin to the sum of blue and black marlin catch was shown in Figure 4 for the coastal longline and the other fisheries. The ratios of blue marlin calculated by the logbook data and RJB data were almost constant among years and were close to 1. This means that almost catches of “blue marlins” are blue marlin, and few black marlin has been caught by Japanese fisheries in the period analyzed. This would be due to the fact that Japanese fisheries have not been operated actively in the East and the South China Sea where black marlin is abundant during the period analyzed.

Size data of blue marlin by distant-water and offshore longline, shallow-setting longline and drift net were reviewed Table 3 and Figures 5 and 6. The most of size data are collected for the blue marlin caught by distant-water and offshore longline (Table 3). For the distant-water and offshore longline, the size range in EFL was between 125 and 250 cm with the mode between 150 and 170 cm, and processed weight range was between 25 and 150 kg with the mode between 35 and 45 kg. Size data in processed weight of blue marlin caught by shallow-setting longline and drift net had a similar character, and almost all data were measured mainly in the 1970s and 1980s, and only in processed weight. Size range of blue marlin was between 50 and 200 kg with the mode between 100 and 135 kg.

References

Kimoto, A. and Yokawa, K. 2012a. Overview of the Japanese fisheries for blue marlin in the Pacific Ocean up to 2010. ISC/12/BILLWG/1/08.

Kimoto, A. and Yokawa, K. 2012b. Review of size data for blue marlin caught by Japanese fisheries in the Pacific Ocean since 1970s. ISC/12/BILLWG/1/09.

Table1. Japanese blue marlin quarterly catch (mt) by distant-water longline, 1971-2011, and catch of 2010 and 2011 are preliminary.

Year	Qt1	Qt2	Qt3	Qt4	Total
1971	1897.67	1667.37	1894.47	1404.09	6863.60
1972	2546.83	2241.32	2123.21	1581.47	8492.82
1973	2854.97	2606.59	1661.11	2001.90	9124.57
1974	2493.89	2081.18	1740.52	1757.23	8072.82
1975	1585.30	1269.16	1614.79	1187.95	5657.20
1976	1469.56	1817.87	2050.28	1807.69	7145.40
1977	2100.54	2033.47	1838.00	1877.47	7849.48
1978	2329.87	2629.79	2128.96	1705.27	8793.88
1979	2269.30	2761.66	2148.59	2184.34	9363.89
1980	3410.30	2755.63	2145.29	2075.43	10386.65
1981	2785.43	3085.01	2281.91	1951.21	10103.56
1982	3073.80	3152.07	2542.33	2049.47	10817.66
1983	2997.18	2753.73	1918.15	2116.48	9785.53
1984	3968.49	3271.98	2547.35	2465.36	12253.18
1985	3206.26	2718.28	1665.43	1761.95	9351.91
1986	3360.83	3616.61	2301.72	2075.93	11355.09
1987	2743.73	3506.59	3153.66	2296.02	11700.00
1988	3796.28	2883.85	1952.41	1475.81	10108.34
1989	2268.99	2446.85	2100.15	1931.51	8747.51
1990	2357.68	2171.76	1316.48	1867.96	7713.88
1991	2417.09	2675.61	1468.85	1774.14	8335.69
1992	2769.55	2748.52	1790.57	1598.98	8907.63
1993	2621.92	2704.83	2026.31	2111.89	9464.96
1994	3036.48	3004.13	2433.07	2660.12	11133.79
1995	2743.92	2659.89	2175.61	1737.23	9316.65
1996	1342.05	1308.94	1056.13	951.48	4658.60
1997	1207.89	1615.13	1679.47	1642.89	6145.38
1998	1609.17	1487.60	1257.28	1067.84	5421.88
1999	1167.38	989.24	997.04	934.58	4088.24
2000	1003.58	797.07	1198.45	1024.97	4024.06
2001	924.59	991.12	1091.73	1054.12	4061.56
2002	1098.63	1036.74	842.37	811.72	3789.45
2003	1235.84	947.81	712.44	811.81	3707.89
2004	1043.64	747.09	692.97	911.48	3395.18
2005	1111.69	697.26	639.65	437.66	2886.26
2006	589.68	719.05	600.25	597.12	2506.10
2007	786.95	537.45	452.37	388.43	2165.20
2008	510.53	525.50	429.61	377.34	1842.97
2009	550.08	396.81	398.20	581.96	1927.04
2010	704.51	657.27	452.39	419.81	2233.97
2011	599.59	580.21	436.89	272.75	1889.44

Table2. Japanese blue marlin catch (mt) by fishery, 1971-2011; “-“ indicates no effort or data not available, “0” indicates less than 1 metric ton, and catch of 2010 and 2011 are preliminary. Others include primarily harpoon and trolling.

Year	Coastal longline	Other longline	Squid drift net	Drift net	Bait fishing	Net fishing	Trap net	Others
1971	112.93	-	-	-	5.90	-	0.98	48.21
1972	211.27	-	-	7.87	6.89	0.98	1.97	49.19
1973	211.27	-	-	263.67	22.63	45.26	1.97	86.58
1974	181.08	0.98	-	226.28	61.00	1.97	3.94	45.26
1975	464.39	1.97	-	782.15	145.61	0.98	2.95	75.76
1976	424.48	4.92	-	571.61	199.72	4.92	2.95	309.91
1977	516.97	0.98	-	981.87	190.86	23.61	1.97	127.90
1978	826.56	0.98	-	869.71	196.77	2.95	2.95	386.65
1979	747.70	0.00	-	504.71	165.28	5.90	2.95	256.78
1980	683.45	2.95	-	853.97	137.74	0.00	1.97	113.14
1981	798.33	3.94	-	1146.17	184.96	14.76	3.94	122.00
1982	702.92	2.95	-	939.56	169.22	25.58	3.94	214.48
1983	1030.04	4.92	-	915.95	227.27	147.58	11.81	275.47
1984	1271.49	1.97	2.95	239.07	182.99	204.64	2.95	215.46
1985	1009.60	11.81	6.89	394.52	298.10	127.90	13.77	202.67
1986	874.27	2.95	1.97	173.15	365.99	49.19	11.81	87.56
1987	1485.67	8.85	0.00	251.86	281.38	43.29	5.90	69.85
1988	1415.58	5.90	4.92	357.13	229.23	31.48	8.85	99.37
1989	1227.68	2.95	6.89	288.26	388.61	42.30	7.87	72.80
1990	1172.18	-	3.94	247.93	249.89	30.50	9.84	132.82
1991	1306.54	-	1.97	175.12	169.22	36.40	14.76	13.77
1992	1613.21	-	6.89	158.40	150.53	22.63	14.76	12.79
1993	2036.72	-	-	143.64	186.93	40.34	10.82	36.40
1994	1510.87	-	-	154.46	139.70	16.73	39.35	13.77
1995	1785.60	0.98	-	139.70	171.19	33.45	22.63	9.84
1996	1096.74	2.95	-	105.27	177.09	19.68	5.90	13.77
1997	950.98	0.98	-	74.77	233.17	16.73	11.81	4.92
1998	1088.63	1.97	-	54.11	282.36	1.97	9.84	14.76
1999	1090.47	0.98	-	75.76	170.20	0.98	4.92	4.92
2000	1208.29	9.84	-	20.66	193.82	0.98	9.84	11.81
2001	1155.23	7.87	-	159.38	135.77	0.98	5.90	6.89
2002	853.13	9.84	-	104.29	148.56	0.00	13.77	3.94
2003	977.29	3.94	-	36.40	175.12	0.00	12.79	3.94
2004	1139.19	6.89	-	19.68	191.85	0.00	9.84	16.73
2005	979.73	5.90	-	36.40	191.85	-	6.89	10.82
2006	985.72	1.97	-	31.48	138.72	0.00	11.81	7.87
2007	1103.65	0.98	-	74.77	159.38	0.00	18.69	12.79
2008	1146.69	1.97	-	31.48	199.72	2.95	32.47	9.84
2009	1091.11	3.94	-	57.06	157.41	0.00	16.73	13.77
2010	1459.08	2.95	-	92.48	222.35	0.00	24.60	5.90
2011	949.05	6.89	-	97.40	234.15	0.00	21.64	14.76

Table 3. Annual number of length in EFL (cm) or processed weight (kg) data of blue marlin caught in the Pacific Ocean by type of fishery for the period between 1970 and 2011.

Year	Distant-water and offshore	Distant-water and offshore	Shallow-set	Drift net	Trolling	Others	Total
	longline	longline	longline				
	Length	Weight	Weight	Weight	Weight	Weight/Length	
1970	6734	5879	0	0	0	4	12617
1971	3750	9511	0	0	0	2	13263
1972	4979	9603	0	0	0	1	14583
1973	4259	9475	0	0	0	0	13734
1974	3952	9149	0	0	0	2	13103
1975	3167	4913	0	0	0	184	8264
1976	3861	4768	2778	0	0	0	11407
1977	3898	11601	1408	155	0	249	17311
1978	5998	13216	1167	867	0	413	21661
1979	5543	8975	245	776	0	415	15954
1980	5823	10729	0	26	4	1	16583
1981	3725	6301	70	12	0	9	10117
1982	4803	12536	141	26	0	86	17592
1983	5353	18415	624	1145	5	3	25545
1984	7458	20975	123	554	8	1	29119
1985	5531	17507	206	466	8	1301	25019
1986	7805	27957	79	311	2	1	36155
1987	7602	24547	69	24	5	1	32248
1988	8558	23689	20	133	20	0	32420
1989	8765	18241	57	42	18	0	27123
1990	10048	10150	131	3	10	0	20342
1991	10803	13658	0	0	9	6	24476
1992	7365	16410	57	4	16	0	23852
1993	9285	16963	7	230	14	1	26500
1994	9731	17941	15	1	6	0	27694
1995	7438	20929	41	13	17	0	28438
1996	4673	13053	7	0	9	5	17747
1997	6732	12023	2	0	5	0	18762
1998	3345	18091	27	27	1	0	21491
1999	2951	14275	3	1	2	2	17234
2000	3006	14466	13	0	8	1	17494
2001	2762	16809	4	0	1	1	19577
2002	2694	11093	0	0	2	0	13789
2003	2740	9496	0	2	7	0	12245
2004	2212	11795	0	0	0	1	14008
2005	2938	6307	1	0	5	0	9251
2006	3231	4230	3	0	3	1	7468
2007	4640	4106	6	0	18	2	8772
2008	5235	6312	3	0	0	5	11555
2009	4714	5992	10	0	0	6	10722
2010	5078	7171	4	0	0	1	12254
2011	4294	7486	0	0	0	0	11780
Total	227479	526743	7321	4818	203	2705	769269

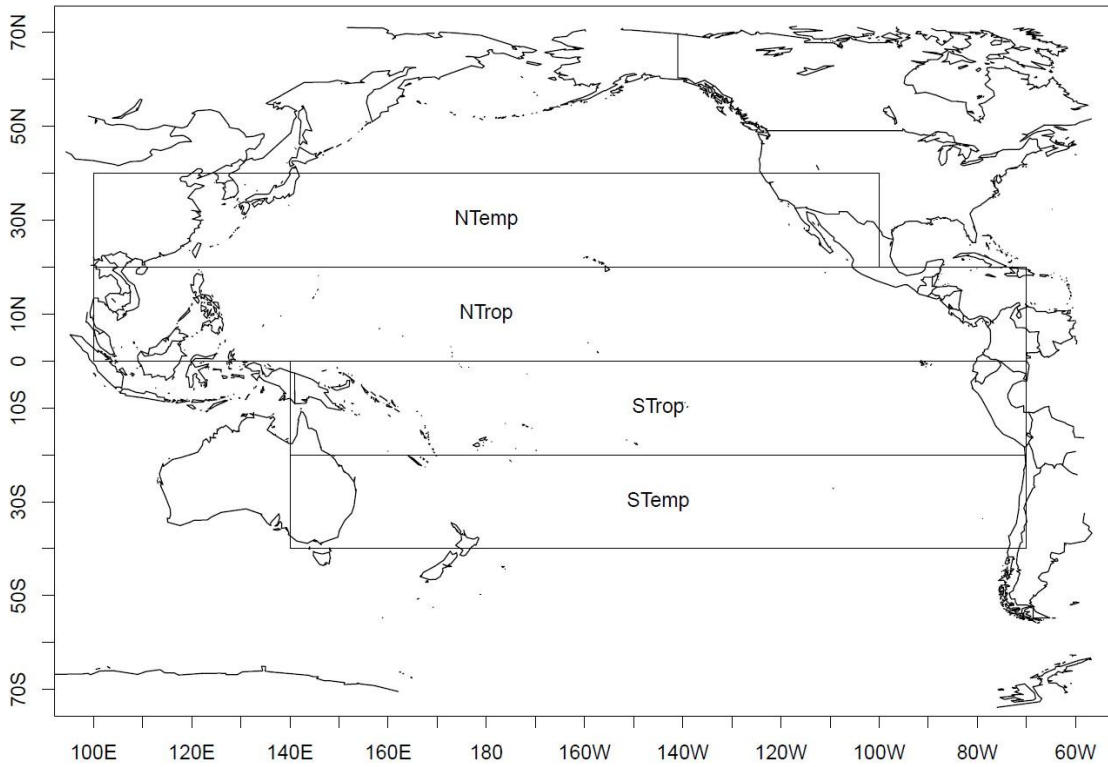


Figure 1. Area stratification: 4 areas (NTemp, NTrop, STrop, and STemp).

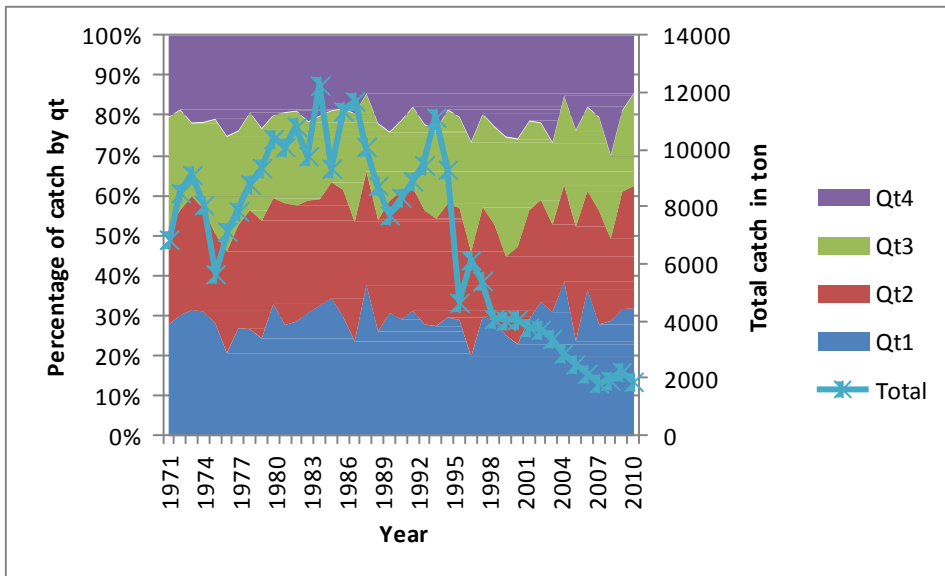


Figure 2. Total catch amount and the percentage of quarterly catch of blue marlin caught by Japanese distant-water and offshore longline.

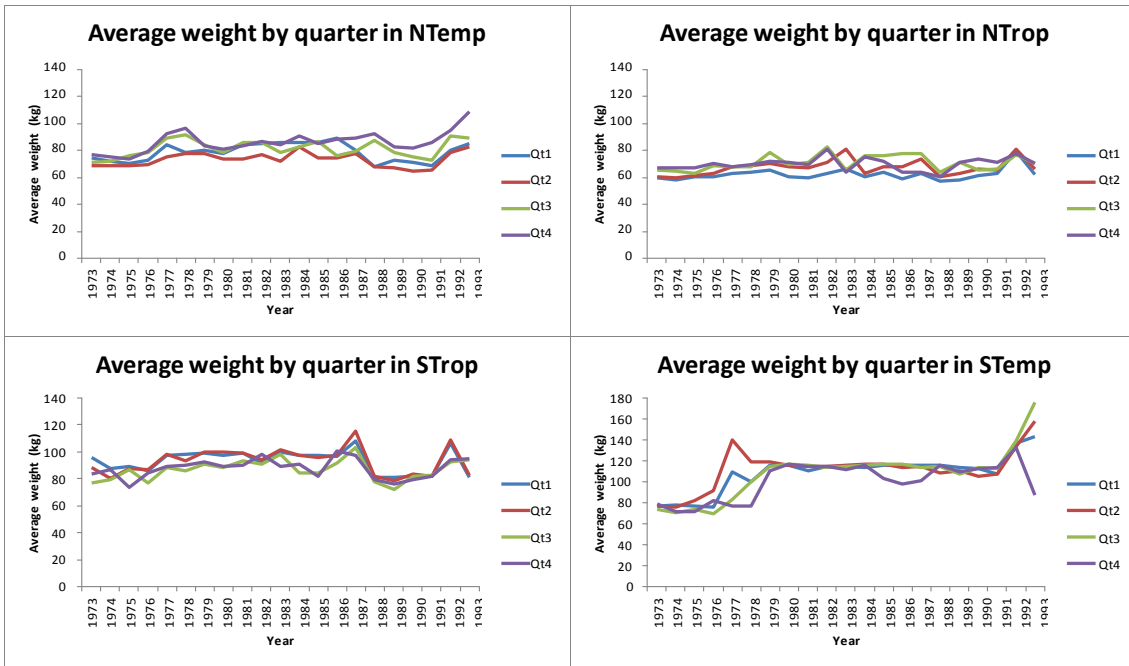


Figure 3. Average weight of blue marlin, caught by distant-water and offshore longline, by area (Figure 1) and quarter in the period between 1973 and 1993.

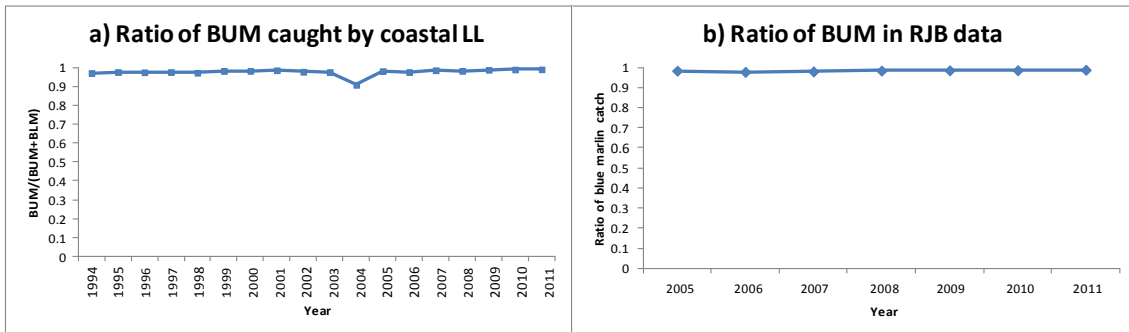


Figure 4. Ratio of blue marlin catch to the sum of blue and black marlin catch using coastal logbook data (right), and RJB data (left).

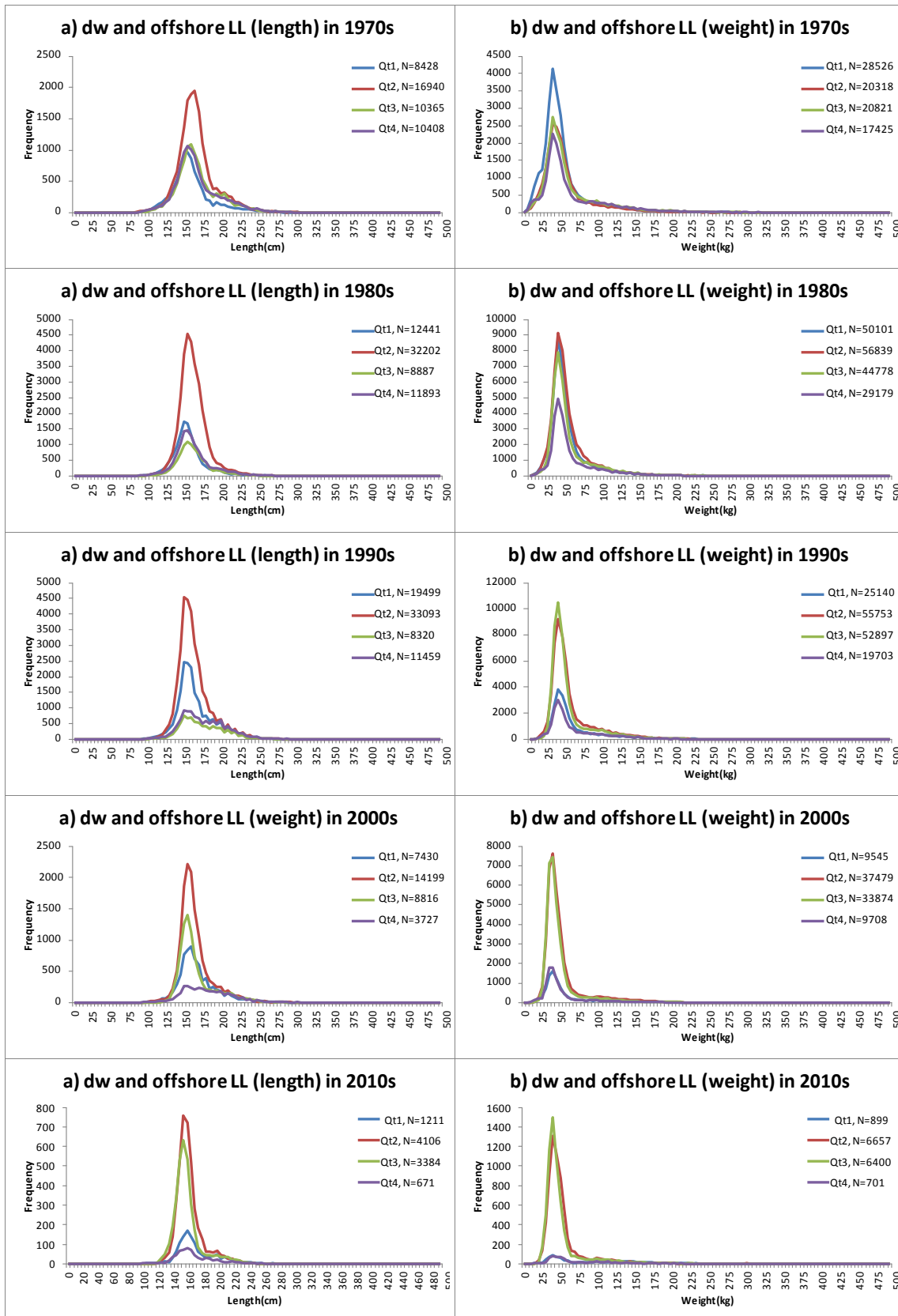


Figure 5. Decennial frequency distribution (a, right column) in EFL (cm) and (b, left column) in processed weight (kg) of blue marlin caught by distant-water longline by decade between 1970s and 2010s. The graph was not made for the extremely small sample size.

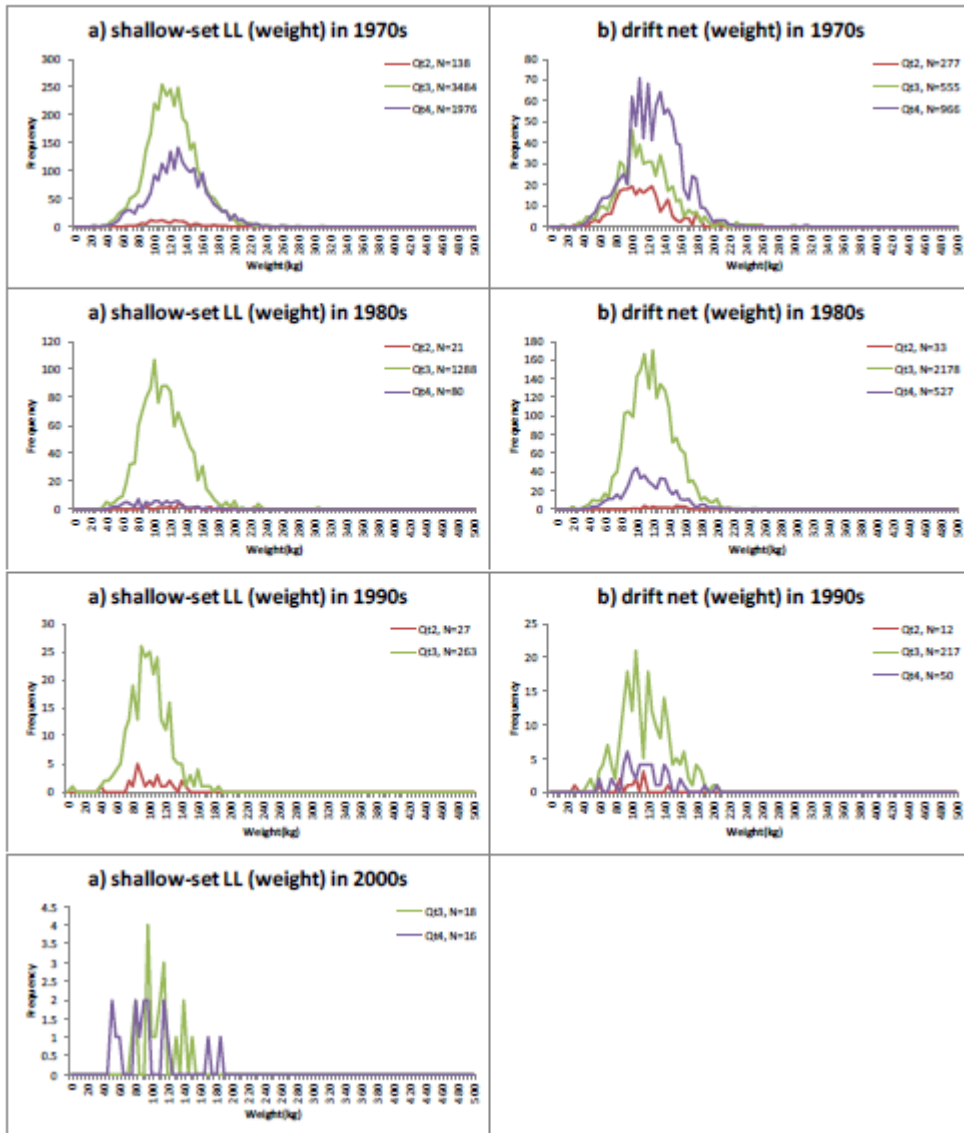


Figure 6. Decennial frequency distribution in processed weight (kg) of blue marlin caught by shallow-set longline (a, right column) and drift net (b, left column) by decade between