

**Review of Japan's size data for striped and blue marlin  
caught by offshore and distant water longliners<sup>1</sup>**

Hirokazu Saito

National Research Institute of Far Seas Fisheries, Japan

5-7-1, Orido, Shimizu-ku, Shizuoka 424-8633, JAPAN

---

<sup>1</sup>Working document prepared for the joint session of the Marlin and Swordfish Working Groups of the Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, Shimizu, Shizuoka, Japan, August 29 – September 2 2005. Document not to be cited without permission of the authors.

Review of Japan's size data for striped and blue marlin  
caught by offshore and distant water longliners

Hirokazu Saito

National Research Institute of Far Seas Fisheries, Japan  
5-7-1, Orido, Shimizu-ku, Shizuoka 424-8633, JAPAN

## Back ground

In the fourth ISC meeting, Saito and Yokawa (2004) reported the results of length distribution of sexed blue and striped marlin by using database obtained from the Japanese distant and offshore longline fishery. The outline of this study is as follows;

### Both fish

- The total coverage of sexed size data was 5 %.
- Coverage of data of areas in the north Pacific was higher than areas in other regions.
- Though the coverage of data in the southeast Pacific was high, the catch number of the fish was less than the other areas.
- The differences of sex ratio were caused by various factors such as year and rough area stratification, fishing ground.

### Striped marlin

- The number of sexed size data of striped marlin was 13 thousands and 141 thousands by commercial vessel and training vessel.
- Largest number of catch recorded in the west of 170° W between 20° N to 30° N.
- The difference of the sex ratio was smaller than that of blue marlin.

### Pacific blue marlin

- The number of sexed size data was 14 thousands by commercial vessel and 134 thousands by training vessel.
- Largest number of catch recorded in the west of 170° W between 10° N to 10° S.
- The patterns of the length frequency distribution in each areas calculated by using database obtained from commercial and training vessel were not always the same each other.
- Sex ratio did not correspond between commercial and training vessel.

In this document, same size database as former study for periods between 1975 and 2004 is used (size data in 2004 is incomplete).

## Results and Discussion

To review the number of sexed size data, Pacific Ocean was divided into twelve areas shown in Figure 1. Number of sexed length data is summarized by area, quarter and five years. Tables 1 and 2 show the results of this analysis. Sexed length data of 1980-1984 and 2000-2004 for both marlins and 1990-1994 for blue marlin are preliminary. Sexed size data collected by commercial vessel in this database exists from 1992 to 2004.

Based on the experience in the estimation of catch at size of swordfish caught by Japanese longliners in the north Atlantic, Yokawa and Fukuda (2004) reported that it is considered to have possibility of successful estimation of catch at size, if one particular area has more than 50 size data in more than three quarters of four in four or five years period. Table 3 shows the summary of result of the analysis. The coverage of sexed length data collected by training vessel was high in the areas 3, 7, 8 and 9. The results of the analysis indicate that the possibility of successful estimation of catch at size exist in areas of the northwest and central north Pacific for striped and Pacific blue marlin by the data collected from training vessel. The coverage of data collected by training vessel has decreased after 1995. The data collected by commercial vessel seemed to be useful only in Area 9 (10N - 10 S, 130W – 180).

Figure 2 shows the length frequency distributions of striped marlin recorded by training vessel in 1980 and 1981 by quarter and sex in Area 8 (10 - 20 N, 130W – 180). This figure indicates that there is a few mode in each sexed size data by quarter. This result suggests the possibility that the Japanese longliners data may separate by age groups, sex and quarter, such as the report shown by Skillman and Yong (1976). However, the data of sex ratio should be compared with the other database, because reported sex ratio did not correspond between commercial and training vessel (Saito and Yokawa 2004).

Figure 3 shows the length frequency distributions of Pacific marlin recorded by training vessel in 1985 and 1986 by quarter and sex in Area 8 (10 - 20 N, 130W – 180). This figure indicates that the data seemed to be monomodal distribution for male and less data to separate the modes for female. This result suggests that it is hard to separate age-groups if we use only by the Japanese longliners data. To separate the sexed size data for Pacific blue marlin, we should collect information about sex ratio in some areas, seasons and fisheries.

## Reference

Saito, H. and K. Yokawa. 2004. Size composition and sex ratio for Pacific blue marlin, *Makaira mazara*, and striped marlin, *Tetrapturus audax*, caught by Japanese longliner in the Pacific. ISC4/04/MARLIN-WG/1 13pp.

Skillman, A. R. and M.Y.Y.Yong. 1976. Von Bertalanffy Growth Curves for Striped marlin, *Tetrapturus audax*, and Blue marlin, *Makaira nigricans*, in the central North Pacific Ocean. Fishery Bulletin: Vol.74(3)553-566.

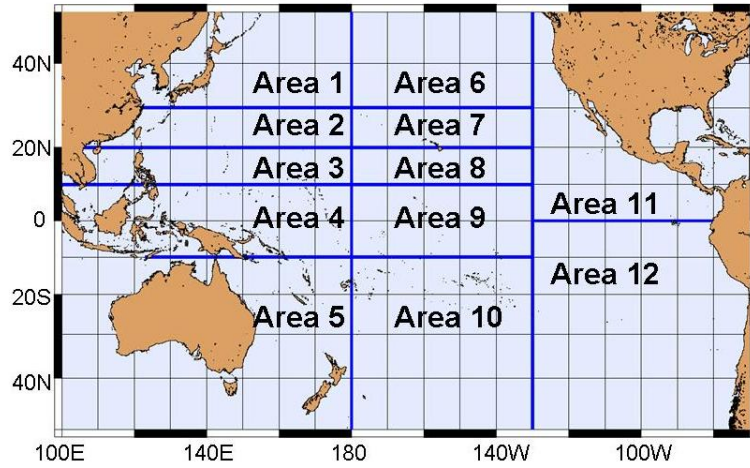


Figure 1. The designation of the areas used in this study.

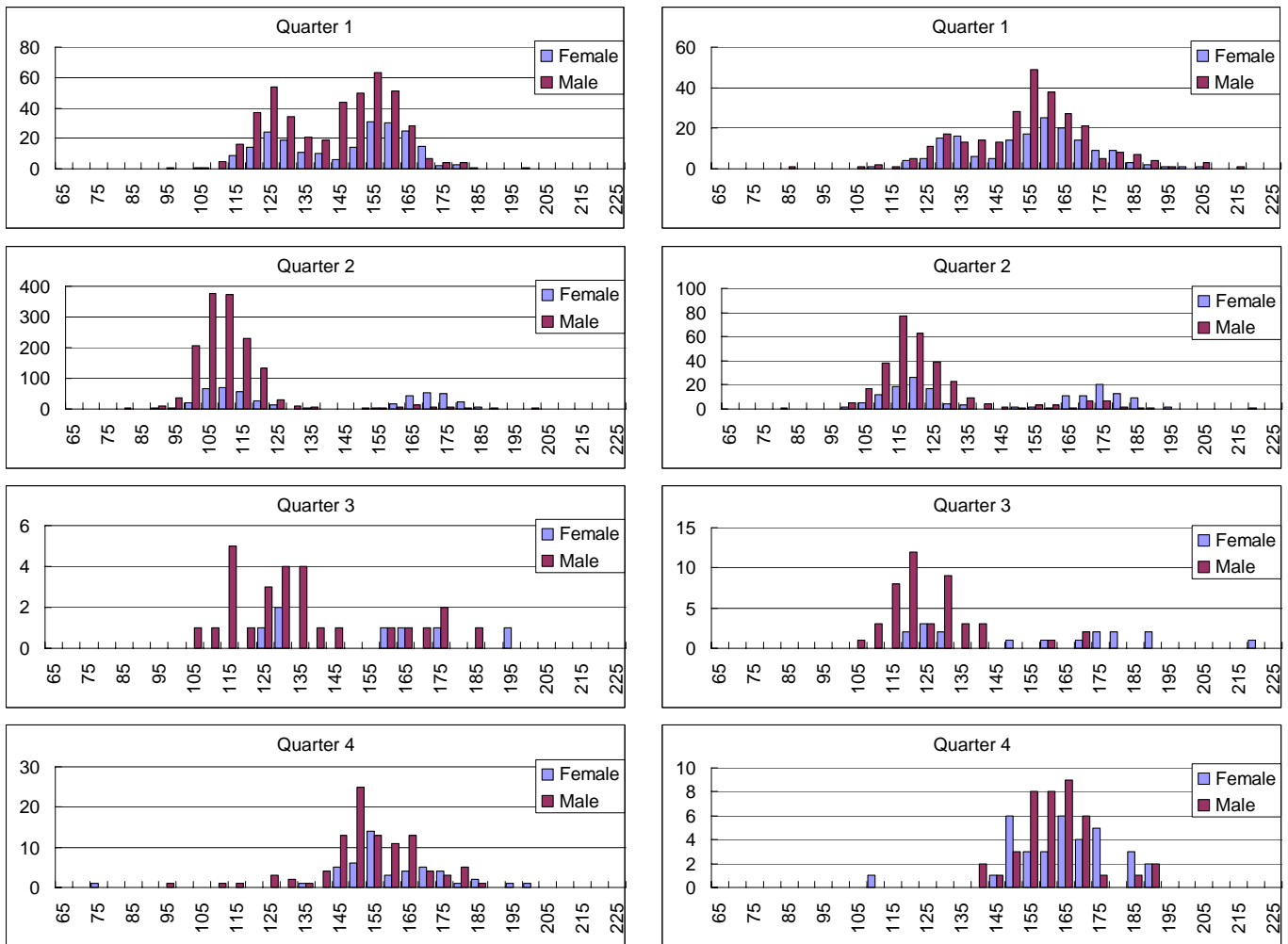


Figure 2. Length frequency distributions of striped marlin recorded by training vessel in 1980 (left) and 1981 (right) by quarter and sex in Area 8 (10N-20N, 130W-180).

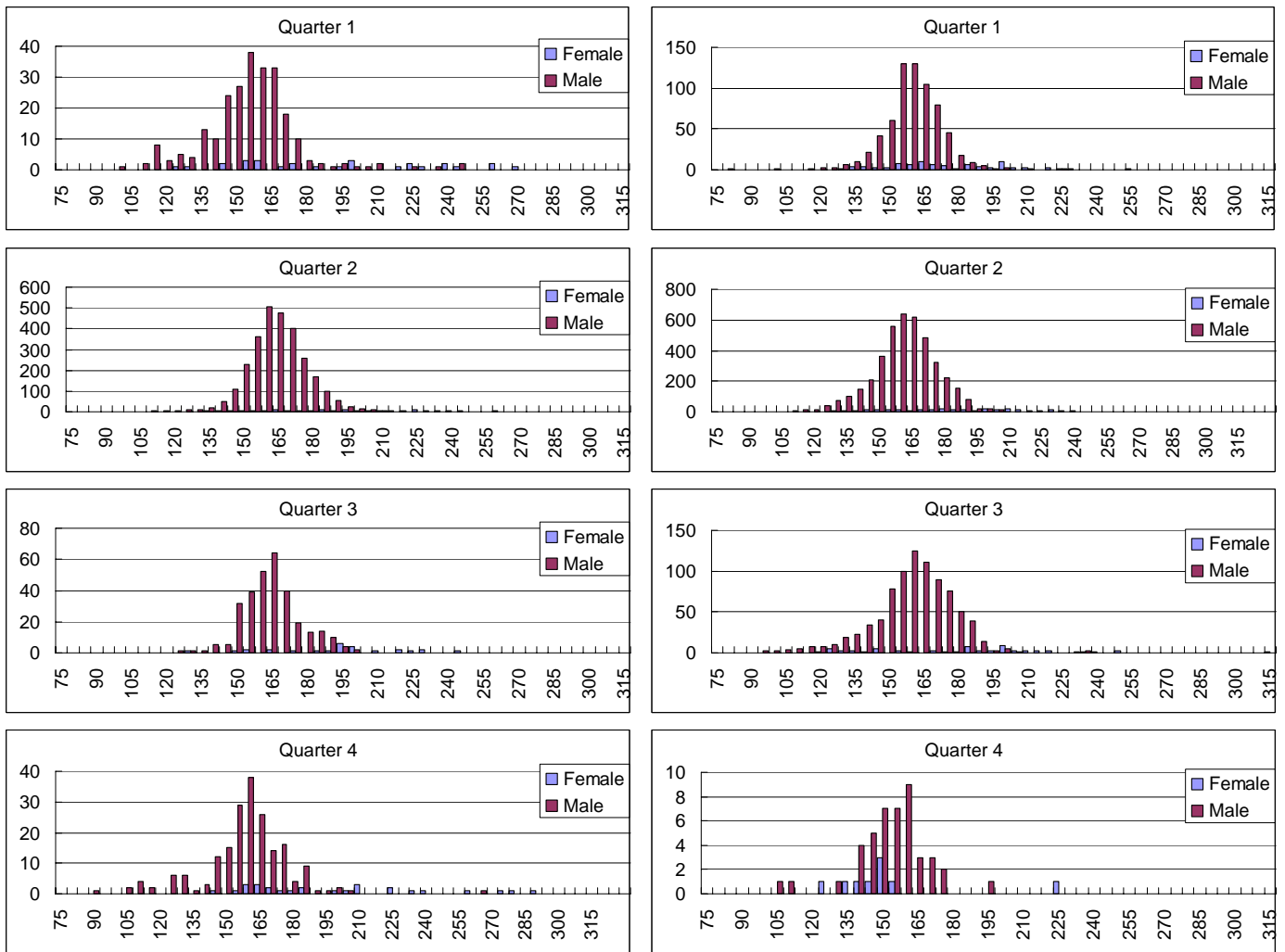


Figure 3. Length frequency distributions of Pacific blue marlin recorded by training vessel in 1985 (left) and 1986 (right) by quarter and sex in Area 8 (10N-20N, 130W-180).

Table 1. Number of sexed length data by area and quarter of striped marlin caught by Japanese commercial longliners and Japanese training vessel recorded between 1975 and 2004.

1975-1979								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	0	0
Area 2	0	0	0	0	195	2	2	0
Area 3	0	0	0	0	827	169	25	251
Area 4	0	0	0	0	49	42	21	22
Area 5	0	0	0	0	155	28	443	4033
Area 6	0	0	0	0	88	0	8	291
Area 7	0	0	0	0	386	5170	485	265
Area 8	0	0	0	0	1800	4667	482	356
Area 9	0	0	0	0	380	543	336	154
Area 10	0	0	0	0	12	323	388	137
Area 11	0	0	0	0	20	221	99	1
Area 12	0	0	0	0	20	11	51	219

1980-1984								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	14	0
Area 2	0	0	0	0	0	39	2	34
Area 3	0	0	0	0	519	801	48	139
Area 4	0	0	0	0	27	3	4	8
Area 5	0	0	0	0	0	0	13	126
Area 6	0	0	0	0	0	15	2	363
Area 7	0	0	0	0	12	752	11	262
Area 8	0	0	0	0	2074	4008	320	576
Area 9	0	0	0	0	416	140	37	226
Area 10	0	0	0	0	2	17	16	2
Area 11	0	0	0	0	18	0	0	0
Area 12	0	0	0	0	80	16	2	32

1985-1989								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	17	1	1
Area 2	0	0	0	0	189	247	39	22
Area 3	0	0	0	0	2011	1423	15	401
Area 4	0	0	0	0	246	16	9	5
Area 5	0	0	0	0	11	0	0	0
Area 6	0	0	0	0	13	0	645	1421
Area 7	0	0	0	0	263	4585	427	2589
Area 8	0	0	0	0	4962	4924	490	869
Area 9	0	0	0	0	875	105	35	328
Area 10	0	0	0	0	0	27	15	99
Area 11	0	0	0	0	0	0	0	0
Area 12	0	0	0	0	0	49	5	46

1990-1994								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	1	0	0	34	1	8	0	74
Area 2	0	0	0	0	676	737	10	4
Area 3	0	0	0	0	3384	3837	211	305
Area 4	0	0	0	0	51	25	2	10
Area 5	0	0	0	0	0	18	105	0
Area 6	0	0	0	0	0	0	0	0
Area 7	0	0	0	0	0	0	0	0
Area 8	0	2	19	3	2	81	6	150
Area 9	73	11	42	46	221	227	27	211
Area 10	0	2	19	3	2	81	6	150
Area 11	10	20	3	20	2	0	0	0
Area 12	225	392	450	366	2	22	0	17

1995-1999								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	13	3	77
Area 2	0	0	0	0	481	152	0	131
Area 3	0	0	0	0	795	1126	12	0
Area 4	0	0	0	3	0	2	0	1
Area 5	0	0	0	1	0	0	0	0
Area 6	0	0	3	0	0	0	1519	1803
Area 7	0	0	78	242	43	10	1074	7410
Area 8	0	67	10	12	8958	5949	60	1677
Area 9	76	107	160	110	48	92	0	5
Area 10	1	15	19	1	232	102	6	0
Area 11	32	136	295	3	0	0	0	46
Area 12	871	1198	1277	1886	0	0	0	0

2000-2004								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	1	31	27
Area 2	0	0	0	0	413	23	0	92
Area 3	0	0	0	0	647	285	0	95
Area 4	0	0	0	0	34	9	0	13
Area 5	0	0	0	0	0	0	0	0
Area 6	0	0	0	0	0	0	524	680
Area 7	0	0	0	0	88	0	256	3396
Area 8	0	0	0	0	7214	1849	0	258
Area 9	23	39	61	15	83	40	0	15
Area 10	0	0	0	1	0	8	0	0
Area 11	57	23	121	19	0	0	0	0
Area 12	186	610	1062	549	0	6	0	0

Table 2. Number of sexed length data by area and quarter of blue marlin caught by Japanese commercial longliners and Japanese training vessel recorded between 1975 and 2004.

1975-1979								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	1	0	0	0
Area 2	0	0	0	0	10	1	12	0
Area 3	0	0	0	0	321	206	54	546
Area 4	0	0	0	0	643	684	1052	997
Area 5	0	0	0	0	99	16	256	717
Area 6	0	0	0	0	2	0	0	8
Area 7	0	0	0	0	10	1614	631	15
Area 8	0	0	0	0	635	5734	685	416
Area 9	0	0	0	0	951	849	1335	1491
Area 10	0	0	0	0	42	546	71	17
Area 11	0	0	0	0	67	43	8	0
Area 12	0	0	0	0	39	20	4	50

1980-1984								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	0	0
Area 2	0	0	0	0	0	78	12	6
Area 3	0	0	0	0	508	3083	484	276
Area 4	0	0	0	0	384	12	236	167
Area 5	0	0	0	0	0	0	0	3
Area 6	0	0	0	0	0	0	0	4
Area 7	0	0	0	0	0	275	38	23
Area 8	0	0	0	0	1425	7932	1854	1185
Area 9	0	0	0	0	2598	702	1449	3279
Area 10	0	0	0	0	45	61	15	0
Area 11	0	0	0	0	5	0	0	0
Area 12	0	0	0	0	6	38	0	1

1985-1989								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	0	0
Area 2	0	0	0	0	20	93	34	11
Area 3	0	0	0	0	975	5876	685	616
Area 4	0	0	0	0	786	57	106	106
Area 5	0	0	0	0	0	0	0	0
Area 6	0	0	0	0	0	0	59	66
Area 7	0	0	0	0	5	219	65	273
Area 8	0	0	0	0	1735	12003	2153	566
Area 9	0	0	0	0	3472	1111	1429	4540
Area 10	0	0	0	0	0	21	11	182
Area 11	0	0	0	0	0	0	0	0
Area 12	0	0	0	0	0	17	1	57

1990-1994								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	0	5
Area 2	0	0	0	0	65	331	26	7
Area 3	0	0	0	0	1559	5831	1108	956
Area 4	0	1	0	0	706	209	223	222
Area 5	0	0	5	0	0	0	0	0
Area 6	0	0	0	0	0	0	44	32
Area 7	0	0	0	1	20	70	232	1196
Area 8	26	0	0	0	4625	12476	1139	594
Area 9	335	197	216	145	2335	627	1105	2809
Area 10	0	1	12	8	92	53	8	235
Area 11	26	61	2	20	0	0	0	0
Area 12	821	597	294	682	20	8	0	8

1995-1999								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	3	4
Area 2	0	0	0	0	89	31	11	35
Area 3	0	0	0	0	545	826	17	44
Area 4	0	0	0	20	0	21	0	16
Area 5	0	0	0	10	0	0	0	0
Area 6	0	0	2	0	0	0	166	206
Area 7	0	0	59	66	16	0	144	683
Area 8	0	192	45	21	3625	6157	286	298
Area 9	338	737	456	306	40	233	0	106
Area 10	23	15	16	4	96	69	4	0
Area 11	39	257	205	6	0	0	0	0
Area 12	1959	1494	1172	1037	0	0	0	0

2000-2004								
Area	Commercial vessel				Training vessel			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Area 1	0	0	0	0	0	0	1	1
Area 2	0	0	0	0	97	8	1	23
Area 3	0	0	0	0	193	702	7	78
Area 4	0	0	0	0	7	93	0	140
Area 5	0	0	0	0	0	0	0	0
Area 6	0	0	0	0	0	0	60	58
Area 7	0	0	0	0	7	0	51	364
Area 8	0	0	0	0	2127	2744	2	181
Area 9	83	253	176	54	121	68	5	50
Area 10	0	0	0	24	0	6	0	3
Area 11	30	60	158	6	0	0	0	0
Area 12	517	295	124	262	0	4	0	6

Table 3. Historical coverage of sexed length data for striped and blue marlin by area and quarter. Number in table shows area which has more than 50 size data in at least three quarters of four in designated period.

Striped marlin		
Period	Commercial vessel	Training vessel
1975-1979	-	3, 5, 7, 8, 9, 10
1980-1984	-	3, 8, 9
1985-1989	-	3, 7, 8, 9
1990-1994	-	3, 9
1995-1999	9	2, 8
2000-2004	-	3, 7, 8

Blue marlin		
Period	Commercial vessel	Training vessel
1975-1979	-	3, 4, 5, 8, 9
1980-1984	-	3, 4, 8, 9
1985-1989	-	3, 4, 7, 8, 9
1990-1994	9	3, 4, 7, 8, 9
1995-1999	9	8
2000-2004	9	3, 8, 9