

**Review of size data of swordfish caught by Japanese  
longliners in the north Pacific<sup>1</sup>**

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### **Back ground**

In the second international Pacific swordfish symposium, Yokawa and Uozumi (1997) reported the results of qualitative analysis of length data of swordfish caught by Japanese longliners in the Pacific. The outline of this study is as follows;

- a) Number of length data collected by commercial vessels is small and unsexed.
- b) Number of size data collected by research and training vessels is larger than that by commercial vessels and part of them is sexed.
- c) In either case, number of size data is not enough and their coverage are less than 3%.
- d) Length frequencies constructed by data of research and training vessels is bimodal, while those by commercial vessels is mono-modal. A mode smaller than 100cm eye-fork length (EFL), which is observed in length frequency of research and training vessels, is not observed in those by commercial vessels in all area analyzed. Reason of this is not known.
- e) Number of size data before 1970 is quite small.

Taking into account of the results of former study described above, this document reviews the amount of Japanese length and weight data of swordfish caught by Japanese longliner. In this document, same size database used in the former study for periods between 1970 and 2003 is used (size data in 2003 is incomplete). All weight data of swordfish in the database is processed weight (gilled and gutted).

### **Results and Discussion**

To review the number of size data, the north Pacific is divided into eleven areas shown in Fig. 1. Number of length and weight data is summarized by area, quarter, and 5 years, except for the period of 1995 – 2003 which were spitted into 1995-1998 and 1999-2003, because a port sampling program is started in 1999. Tables 1-4 show the results of this analysis. There is no weight data collected by research and training vessels throughout the period analyzed, while most of size data of commercial vessels is weight data before 1999.

Based of the experience in the estimation of catch at size of swordfish caught by Japanese longliners in the north Atlantic (Yokawa and Fukuda, 2004), if one particular area has more than 50 size data in more than 3 quarters in 5 or 4 years period, it is considered to have possibility of useful estimation of catch at size. Summery of the result of this analysis is shown in Table 5.

The results of the analysis roughly indicate that possibility of successful estimation of catch at size only exist in areas in the northwest Pacific (west of dateline) for the period of 1975 – 2003. Length data of 1999 – 2003 in areas 1-3 have a corresponding processed weight data, and this would be used for the estimation of conversion factor. In areas east of dateline, only rough combined length or weight frequency would be available. A result of stock assessment using size data in these data should be treated with gear care.

Result of this study is also indicate that position of length data of commercial vessels does not overlapping with the one of length data of research and training vessels in most of cases. This is, at least, one of the reasons why the shapes of length frequencies are difference between commercial and research and training vessel, indicated in the former study (Yokawa and Uozumi, 1997). Another possible reason is small number of length data of commercial vessels in the areas east of the date line. Figure 2 shows length frequency of Japanese commercial longliners in 1<sup>st</sup> quarter of area 2 for the periods between 1999 and 2002. This figure clearly shows that length data of commercial vessels can detect recruitment of juvenile swordfish into the longline fishery if enough number of data is available.

National research institute of far seas fisheries started to collect sex size data by collaboration of surface longline fishermen in 2004. Number of sex size data in 2004 is about 500. Though the quality of this data set is not so good and screening of data is necessary as some collaborating fishermen has few experience in sex identification, quarterly sex ratio by length class and by area in the northwest Pacific would be available within one or two years.

## **Reference**

- Yokawa, K. and Y. Uozumi (1997); Evaluation and Preliminary Analysis of Size Data of Swordfish Caught by Japanese Longliners during 1970 – 1994. Proceedings of the second international Pacific swordfish symposium. NOAA-TM-NMFS-SWFSC-263
- Yokawa, K. and T. Fukuda (2004); Swordfish dead discards and live releases by Japanese longliners in the North Atlantic Ocean in 2000 – 2002. ICCAT Col. Vol. 56. No. 3. 967-977.

Table 1. Number of length and weight data by area and quarter of swordfish caught by Japanese commercial longliners (left column) and Japanese research and training longliners (right column) in 1970's.

1970-1974, Length, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	28	22	24	49
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	16
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1970-1974, Length, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	1
area 2	0	0	0	0
area 3	0	0	0	6
area 4	36	7	0	8
area 5	56	44	28	71
area 6	0	0	0	39
area 7	0	0	0	3
area 8	52	118	32	12
area 9	381	984	548	241
area 10	0	0	0	2
area 11	13	94	196	104

1970-1974, Weight, Commercial

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	11	0	6	59
area 2	229	3	1654	2372
area 3	134	792	654	87
area 4	61	0	0	14
area 5	65	63	615	45
area 6	113	0	0	520
area 7	9	0	25	62
area 8	117	2	0	0
area 9	301	373	296	161
area 10	76	0	136	33
area 11	34	50	188	29

1970-1974, Weight, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1975-1979, Length, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	3	0	0	0
area 2	15	0	0	0
area 3	0	0	0	0
area 4	0	18	9	1
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	3	32
area 10	0	0	0	0
area 11	34	0	34	0

1975-1979, Length, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	1
area 2	3	0	1	4
area 3	31	34	3	18
area 4	59	71	51	78
area 5	74	0	3	211
area 6	10	2	7	12
area 7	118	1034	49	38
area 8	207	247	324	178
area 9	194	58	28	103
area 10	71	26	5	66
area 11	0	0	0	0

1975-1979, Weight, Commercial

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	698	322	4556	5523
area 2	2435	4150	4195	938
area 3	94	85	171	53
area 4	435	483	414	246
area 5	288	0	0	264
area 6	1	0	0	0
area 7	27	18	0	9
area 8	62	3	5	31
area 9	0	0	0	0
area 10	0	0	0	0
area 11	41	375	185	0

1975-1979, Weight, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

Table 2. Number of length and weight data by area and quarter of swordfish caught by Japanese commercial longliners (left column) and Japanese research and training longliners (right column) in 1980's.

1980-1984, Length, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	5
area 4	0	0	0	0
area 5	2	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1980-1984, Length, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	8	0	0	3
area 2	0	0	3	20
area 3	0	1	2	3
area 4	22	535	74	22
area 5	38	1	17	12
area 6	249	1	0	72
area 7	0	10	0	6
area 8	262	1783	214	168
area 9	436	87	129	285
area 10	20	6	0	0
area 11	4	7	11	0

1980-1984, Weight, Commercial

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	932	127	0	289
area 2	8560	5414	7643	7523
area 3	2773	13079	5115	3537
area 4	202	159	141	167
area 5	359	790	421	32
area 6	183	4	0	0
area 7	0	0	0	0
area 8	0	63	0	0
area 9	69	8	0	0
area 10	0	0	0	0
area 11	1	0	0	0

1980-1984, Weight, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1985-1989, Length, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	9	0	0
area 9	0	0	0	0
area 10	10	17	36	0
area 11	0	0	0	0

1985-1989, Length, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	16	8	2	25
area 3	118	495	78	69
area 4	114	1	5	7
area 5	13	6	26	37
area 6	7	5	12	8
area 7	249	1159	51	85
area 8	387	118	79	334
area 9	1	0	0	0
area 10	0	0	0	0
area 11	1	5	3	0

1985-1989, Weight, Commercial

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	35436	6063	17029	51080
area 2	25791	54937	9705	4990
area 3	595	1240	842	301
area 4	661	1425	1180	482
area 5	649	0	0	294
area 6	32	0	0	0
area 7	22	22	1	1
area 8	65	58	9	4
area 9	151	0	44	699
area 10	22	205	113	31
area 11	769	260	1028	0

1985-1989, Weight, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

Table 3. Number of length and weight data by area and quarter of swordfish caught by Japanese commercial longliners (left column) and Japanese research and training longliners (right column) in 1990 - 1998.

1990-1994, Length, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	5
area 4	0	0	0	0
area 5	2	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1990-1994, Length, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	11	52	7	158
area 9	4	9	12	41
area 10	4	1	1	13
area 11	0	0	0	1

1990-1994, Weight, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	932	127	0	289
area 2	8560	5414	7643	7523
area 3	2773	13079	5115	3537
area 4	202	159	141	167
area 5	359	790	421	32
area 6	183	4	0	0
area 7	0	0	0	0
area 8	0	63	0	0
area 9	69	8	0	0
area 10	0	0	0	0
area 11	1	0	0	0

1990-1994, Weight, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1995-1998, Length, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	1
area 6	0	0	2	3
area 7	0	11	2	0
area 8	83	158	16	19
area 9	0	0	0	1
area 10	77	254	103	6
area 11	0	0	0	0

1995-1998, Length, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	36	95	19	0
area 8	0	16	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

1995-1998, Weight, Commercial vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	38321	6557	8098	23607
area 2	8054	32937	3347	2647
area 3	266	678	772	45
area 4	283	668	484	157
area 5	124	0	0	25
area 6	2	0	0	3
area 7	1	1	0	6
area 8	70	25	7	8
area 9	0	0	0	0
area 10	3	0	0	0
area 11	1891	172	1283	0

1995-1998, Weight, Research & Training vessel

	quarter 1	quarter 2	quarter 3	quarter 4
area 1	0	0	0	0
area 2	0	0	0	0
area 3	0	0	0	0
area 4	0	0	0	0
area 5	0	0	0	0
area 6	0	0	0	0
area 7	0	0	0	0
area 8	0	0	0	0
area 9	0	0	0	0
area 10	0	0	0	0
area 11	0	0	0	0

Table 4. Number of length and weight data by area and quarter of swordfish caught by Japanese commercial longliners (left column) and Japanese research and training longliners (right column) in 1999 - 2004.

1999-2003, Length, Commercial vessel					1999-2003, Length, Research & Training vessel				
	quarter 1	quarter 2	quarter 3	quarter 4		quarter 1	quarter 2	quarter 3	quarter 4
area 1	18143	4569	5905	15117	area 1	0	0	0	0
area 2	1229	7396	501	936	area 2	0	0	0	0
area 3	4	358	12	0	area 3	0	0	0	0
area 4	5	0	0	0	area 4	0	0	0	0
area 5	0	74	60	0	area 5	0	0	0	0
area 6	0	0	1	10	area 6	0	0	0	0
area 7	0	0	0	2	area 7	0	40	0	10
area 8	138	245	243	122	area 8	0	19	0	13
area 9	0	0	0	0	area 9	0	8	0	11
area 10	298	305	223	15	area 10	0	0	0	10
area 11	4	0	0	0	area 11	0	0	0	0

1999-2003, Weight, Commercial vessel					1999-2003, Weight, Research & Training vessel				
	quarter 1	quarter 2	quarter 3	quarter 4		quarter 1	quarter 2	quarter 3	quarter 4
area 1	2833	564	313	4856	area 1	0	0	0	0
area 2	1504	269	446	788	area 2	0	0	0	0
area 3	290	908	534	268	area 3	0	0	0	0
area 4	109	253	359	69	area 4	0	0	0	0
area 5	29	0	0	0	area 5	0	0	0	0
area 6	5	0	0	0	area 6	0	0	0	0
area 7	0	0	0	0	area 7	0	0	0	0
area 8	0	0	0	0	area 8	0	0	0	0
area 9	0	0	0	0	area 9	0	0	0	0
area 10	0	15	0	0	area 10	0	0	0	0
area 11	2272	112	697	0	area 11	0	0	0	0

Table 5. Historical coverage of size data by area and quarter. Number in table shows area which has more than 50 size data in at least 3 quarters of fore in designated period

	Commercial vessel		Research and Training vessel	
	weight data	length data	weight data	length data
1970-1974	2, 3, 5, 9	-	-	8, 9
1975-1979	1, 2, 3, 4	-	-	4, 7, 8, 9
1980-1984	1, 2, 3, 4, 5	-	-	8, 9
1985-1989	1, 2, 3, 4, 11	-	-	3, 7, 8
1990-1994	1, 2, 3, 4, 5	-	-	-
1994-1998	1, 2, 3, 4, 11	-	-	-
1999-2003	1, 2, 3, 4, 11	1, 2, 8, 9	-	-

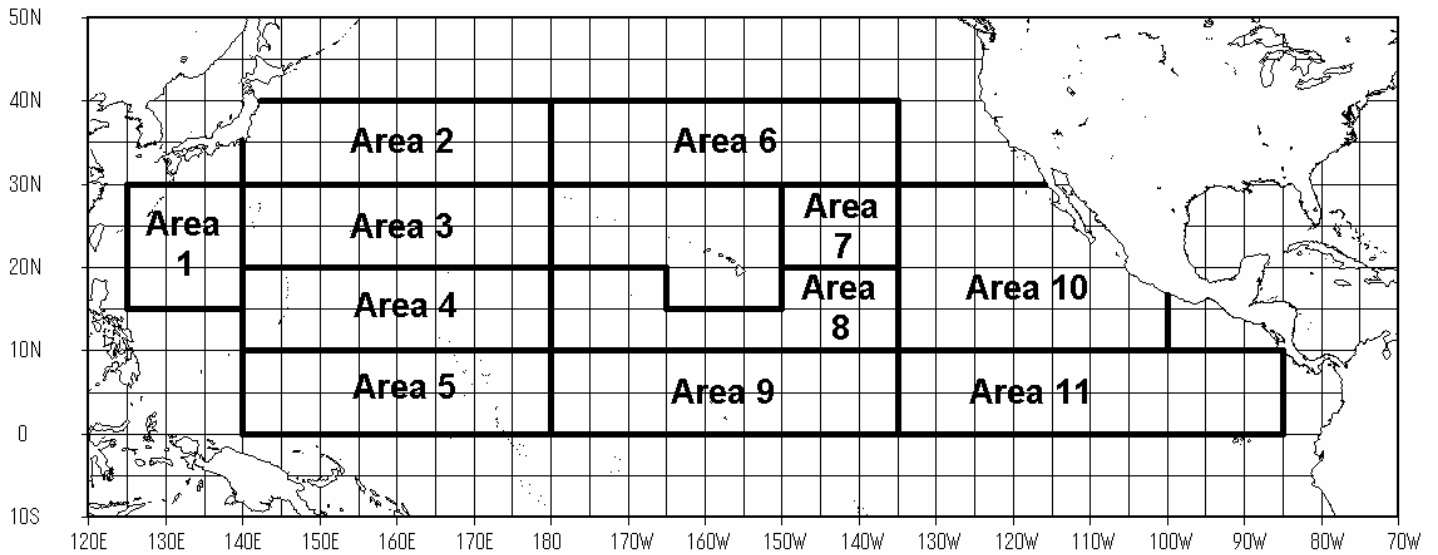


Fig. 1. Area stratification used in this study.

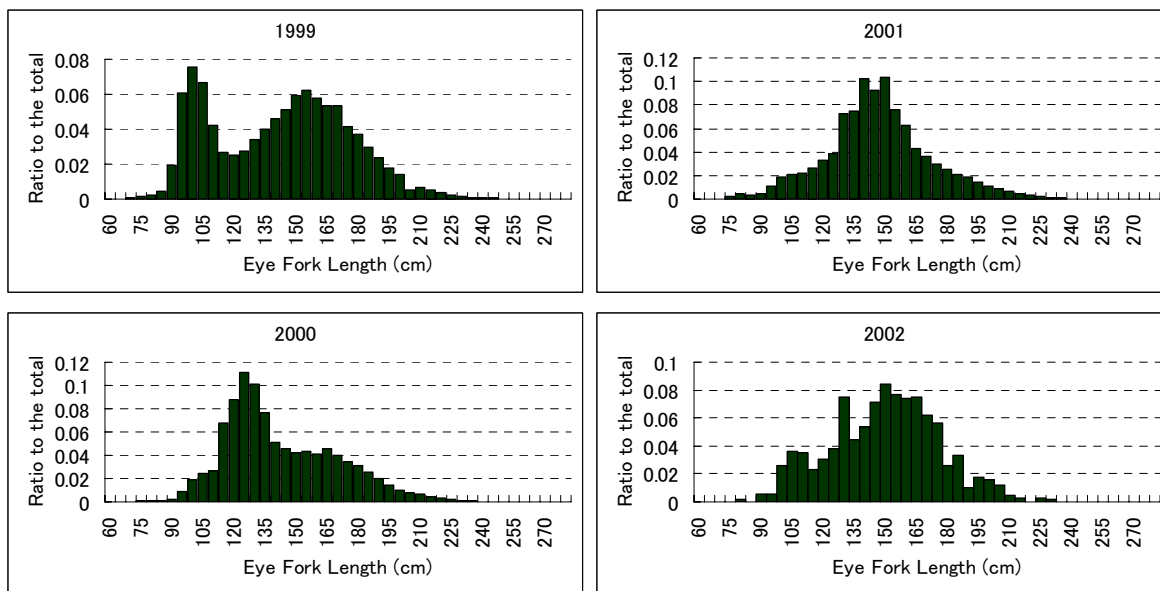


Fig. 2. Length frequency of Japanese commercial longliners in 1<sup>st</sup> quarter of area 2 for the periods between 1999 and 2002.