Change in operation pattern of Japanese SBT longliners in 2007 resulting the enforce of the individual quota system.

IQ 制導入に伴う 2007 年日本延縄船のミナミマグロ操業の変化

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要約

日本のはえ縄漁獲データは CCSBT 資源評価における最も重要なデータであり、2006 年の日本の延縄漁船管理システムが変更されたことによるミナミマグロ延縄漁業の操業パターンへの影響は注意深くモニターしなければならない。本文書は 2007 年の最新の RTMP データからこの問題を検討したものである。2007 年 7 月中旬までの最新 RTMP データを解析したところ、新たな操業が 9 海区･4 月で実施されたこと、ならびに操業回数が大きく減少（2001-2005 年の 7-33%）したこと以外は、4 海区、7 海区、9 海区の操業で 2005 年以前との大きな違いは認められなかった。

Summary

Because the Japanese longline data is the most important scientific data for the stock assessment of southern bluefin tuna in the CCSBT, any changes caused by changing of the regulation rules for the fishery are needed to be monitored carefully. This document is the analyses for the fishery operations in 2007 using the newest data. By analyzing the RTMP data up to mid-July 2007, no obvious changes were observed in the operations in the Area 4, Area 7 and Area9 compare to the operations before 2005, but Area 9 in April is newly covered and the number of operations decreased extremely in all the Area 4, Area 7 and Area 9 (7-33% of 2001-2005).

Introduction

Because the Japanese longline data is the most important scientific data for the stock assessment of southern bluefin tuna (SBT) in the CCSBT, any changes on their operational pattern caused by changing of the regulation rules for the fishery are needed to be monitored carefully. Results of the analyses for the changes of the fishing operations in 2006 have already been reported in the CPUE Workshop held in May 2007 in Shimizu (see Appendix). This document is the analyses for the fishery operations in 2007 using the newest data.

Material and method

The RTMP data in 2007, up to 15 July 2007, were used. It should be noted that the data is tentative and before the careful checking. Five degree longitude, five degree latitude in a month is defined as one “cell”.

Result and Discussion

Because the data is up to the middle of fishing season of this year, analyses can be done at this stage are limited.

Japanese fishery industries decided to allow the number of vessels go for SBT fishing in 2007 was similar to that in 2006. It means that the amount of individual quota is only less than 20 tons each in average, due to the large reduction of the Japanese TAC allowance. Total of 145 vessels were allocated SBT individual quota and they have to report their fishing results to the RTMP. Among the 145 vessels in 2007, 123 vessels are reported for RTMP in 2006, and 144 vessels have experience of RTMP between 2002-2006. Then, it can be said that there was little difference of the vessels in 2007. Up to mid-July, 63 of the 145 vessels have reported their SBT catch. Remaining vessels would operate for SBT in later season.

The numbers of cells operated and operations by CCSBT statistical area and by month are shown in Table 1 and Table 2, respectively. In 2007, operations were conducted from April to July in Area 4, in July in Area5, from April to June in Area 6, from April to July in Area 7, and from April to July in Area 9. The newly Area and month operated is in April in Area 9. From April to June in Area 6 would be newly operated Area and month, if it have not been covered by the NZ chartered longline vessels.

Due to the large reduction of Japanese TAC, probably more than due to the expansion of time and space for operations, the number of operations by Area and month in which large amount of data obtained in the past decreased extremely. For example, the numbers of operations in the main fishing month in 2006 and 2007 to the average number of operations between 2001 and 2005 were 47% and 33% in Area 4 in June, 17% and 23% in Area 7 in June, , 39% and 7% in Area 9 in May, and 45% and 23% in Area 9 in June, respectively

Comparing to those before 2005, little difference, especially for northerly shift, is observed in the effort distributions by 5 degree square between Area 4 and 9 in 2006 and 2007, (see Figure 8 in CCSBT-ESC/0709/SBT Fisheries/Japan). It suggests no obvious change of their target species within the CCSBT Area 4-9 occurred from SBT to other tunas such as bigeye tuna or yellowfin tuna.

While no obvious change in operational patterns was found, it does not necessarily secure the consistency of the operational patterns of Japanese longliners to those in previous years. For

example, because fuel price is so high in recent years, longline vessels might not have moved largely, and the ability of searching for SBT schools in wide area might have been decreased. The IQ system appears to make fishermen to seek for larger fish whose price per weight is much higher than small fish. On the other hand, according to the industry, some market people ask to target on small SBT, which are in short at the market. Furthermore, it is also likely that Japanese longline fishermen want to consume their IQ as soon as possible regardless of the size of SBT, so that they are able to go to other fishing grounds for bigeye tuna and yellowfin tuna quickly and make their economical benefits the largest. We need to consider various factors when examining the Japanese operational patterns and CPUE.

Table 1. Number of the cells operated by year, month and area

Area	4								5		6			
Month	4	5	6	7	8	10	11	12	7	8	4	5	6	7
2001		2	4	4								1	2	1
2002		2	3	6										
2003	1	3	4	4		4	4	4						
2004	2	2	5	6	3				1					
2005	2	2	5	6	1				1					
2006		2	3	4	1				2	3			1	
2007	2	3	5	*6*					*1*		2	2	1	

Area	7							8							
Month	4	5	6	7	9	10	11	5	6	7	8	9	10	11	12
2001	9	6	4	4	2	2	2					11	10	10	
2002	5	6	3	6		3	3					12	13	13	
2003	6	2	2	1	2	1		1				11	13	9	7
2004	2	2	2			1	1	3	4			13	9	9	8
2005	2	2	2					5	5			5	7	8	4
2006		3	2	1	2			1		5	8	7	8	8	7
2007	2	3	2												

Area	9							
Month	4	5	6	7	8	9	10	11
2001		14	20	17	9			
2002		17	14	11				
2003		14	17	15				
2004		19	23	19	12			
2005		25	20	19	13			
2006		21	18	21	15	11	7	4
2007	5	16	18	*15*				

Shadow denotes the values in 2006 and 2007 of which much larger than that in 2005. Data in 2007 is tentative and data in July 2007 (shown in Italics) is uncompleted.

Table 2. Number of operations by year, month and area

Area	4								5		6			
Month	4	5	6	7	8	10	11	12	7	8	4	5	6	7
2001		87	559	509								11	13	1
2002		56	1017	807										
2003	2	347	1015	911		96	120	47						
2004	23	447	1179	1110	10				2					
2005	13	731	1122	732	1				6					
2006		530	457	115	3				11	27			1	
2007	39	55	327	*59*					*11*		14	31	22	

Area	7							8							
Month	4	5	6	7	9	10	11	5	6	7	8	9	10	11	12
2001	905	1741	1058	145	71	85	7					1305	1332	1260	
2002	842	1731	588	44		369	183					1335	755	321	
2003	648	1032	254	1	47	1		1				961	842	825	316
2004	530	646	2			6	13	411	104			489	589	904	618
2005	603	397	3					651	13			551	687	821	488
2006		180	66	46	6			12		76	407	270	343	518	259
2007	27	349	89												

Area	9								総計
Month	4	5	6	7	8	9	10	11	
2001		2384	2508	1944	49				15974
2002		2314	2362	325					13049
2003		2564	2672	586					13288
2004		2383	2826	2832	522				15646
2005		1897	2537	2802	1261				15316
2006		905	1163	1513	1738	1033	262	24	9965
2007	67	159	582	*270*					

Shadow denotes the values in 2006 and 2007 of which much larger than that in 2005. Data in 2007 is tentative and data in July 2007 (shown in Italics) is uncompleted.

Appendix: Document (CCSBT-CPUE/0705/05) submitted for the CCSBT CPUE Workshop in 2007

Change in operation pattern of Japanese SBT longliners in 2006 resulting the enforce of the individual quota system.

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要約

本文書では、2006 年の日本の延縄漁船管理システムが変更されたことによるミナミマグロ延縄漁業の操業パターンの変化を RTMP データから検討する。2006 年には 2001-2005 年の平均値に対して、努力量は 73%、ミナミマグロ漁獲尾数は 62%に減少し、漁獲物に占める小型魚の割合が増加した。漁場ごとの漁期制限の撤廃を反映して、操業セル数は増加し、特に 8 海区、9 海区で著しかった。反面、1 セルあたりの操業回数はほぼ半減した。2006 年の操業船は 2005 年と同一のものが多く、IQ を積極的に利用するための操業パターン変化は認められなかった。2007 年には IQ がさらに減少すること、IQ 制も 2 年目となることから、操業パターンへの影響を今後も注意深く検討していく必要がある。

Summary

In this document, changes in operation pattern of Japanese SBT longliners in 2006 resulting the enforcement of the new regulation rules are examined based on the RTMP data. In 2006, comparing to the averages during 2001-2005, the number of hooks used decreased to 73%, and the number of SBT caught did to 62%, respectively. Proportion of small fish in total catch was large in 2006. The number of cells operated was increased in 2006 especially in the area 8 and area 9 due to abolish of the seasonal area closure. On the other hand, the number of operation per cell decreased to about half of the previous years. Most of the vessels in 2006 were consistent with the vessels in 2005, and no remarkable change to move actively in order to make their IQ in most effectively was observed. In 2007, because IQ further decrease and fishermen become familiar with the IQ system in its second year, careful monitoring and examination of the data on fishing operation pattern is also required for 2007 season.

Introduction

In 2006, Fisheries Agency of Japan changed the regulation rules for Japanese longline fishing

for southern bluefin tuna (SBT) (Itoh 2006). Individual quota (IQ), which was about 35 tons at maximum per vessel, was introduced. At the same time, regulation of seasonal area closures was abolished. In addition, the amount of the total allowable catch was strictly self-regulated. Changes in operation pattern of Japanese SBT longliners in 2006 resulting the enforcement of the new regulation rules are examined in this document.

Material and method

The RTMP data in 2006, as well as past five years (2001-2005), were used. The reasons of using the RTMP data are that data in 2006 is available and that most of the operations could be considered to target on SBT. After the catch and effort in 2006 is summarized, changes in 2006 on the number of cells operated and on the vessel activities are examined by comparing to previous years.

Result

1. Summary of the catch and effort in 2006

Fig.1 shows changes of the number of operations, the number of hooks and the number of SBT caught over the years during 2001-2006 in the CCSBT statistical area 4-9 (below, "the area" means the CCSBT statistical area usually). In 2006, comparing to the averages during 2001-2005, the number of operations decreased to 66%, the number of hooks used did to 73%, and the number of SBT caught did to 62%, respectively. Comparing to the values in 2005, all of the numbers decreased in parallel.

These are further analyzed by the area. Fig.2 shows the proportion by area for the numbers of the operations, hooks used and SBT caught. Those in the area 9 are the largest and have been increasing since 2001 to 2006. Decrease of the proportion is remarkable in the area 7.

Fig. 3 shows the length frequency distribution of SBT by year during 2001-2006. Every year since 2001 to 2005, length with small number (due to poor recruitment) progressed toward larger size and reached around 140 cmFL in 2005. But in 2005, the catch of SBT less than 120 cmFL was larger than in 2004. In 2006, length with small number further progressed up to 150 cmFL but catch of SBT less than 105 cmFL was largest during the six years.

2. Changes of the operation cells

Fig. 4 shows changes of the number of cells (one cell is by 5 degree latitude, 5 degree longitude and month) operated over the years in the area 4-9. The total number of cells in the area 4-9

in 2006 was larger than in 2001-2005. In each area, the number of cells operated was increased in the area 9, decreased in the area 4 and 7, and stable in the area 8.

Table 1 shows the number of cells operated by year, month and area. In 2006, the number of cells operated was increased in the area 5 in July and August, the area 7 in July to September, the area 8 in July and August and the area 9 during July to November. The increases were large in the area 8 and 9.

Fig. 5 shows change of the number of operations per cell over the years. The total of the area 4-9 in 2006 decreased to around half of those during 2001-2005. In each area, the number of operations per cell decreased in the area 8 and 9, decreased largely in the area 7 and was within the range of fluctuation during 2001-2005 in the area 4.

Table 2 shows the number of operations by year, month and area. In the cells largely increased in the area 8 and 9 in 2006, the numbers of operations were not small.

The reason of the new cells produced was considered. Table 3 shows the average body weight of SBT and the total SBT weight per operation in 2006 by the area and month. It is found that the average weight of SBT in the new cells were relatively small, i.e. less valuable. However, it is also found that the total weight per operation were not small in the new cells. Therefore, the total economical gains per operation in the new cells would not small even the main component of the catch was small fish in 2006. If there were operation in the new cell until 2005, it would provide small economical gains because there were few small size fish in those years. It is interpreted that because there were many small SBT in 2006 as described above, these new cells came into substantial fishing grounds.

3. Vessel consistency and activities

Among 133 vessels that caught SBT in the 2006 RTMP, 118 vessels (89%) were those caught SBT in the 2005 RTMP (Table 4). Among the 118 vessels, 70 vessels have operated in the RTMP activities every year sine 2001. Therefore, most of the vessels in 2006 were consistent with the vessels in 2005, as well as for six years.

In the case of that each vessel manage its own individual quota, their operation strategy might be different with the previous quota using system so called Olympic competition system. For example, if catch of SBT were worse economically, there might be an operation strategy like that left the fishing ground once and operate for other species such as bigeye tuna, and then comeback to the area in later days of the year. Possibility of this case was examined based on the operation ratio, which is denoted that a ratio of the number of operations in the area of the vessel to the days between the first and the last days of the vessel operate in the area. If the vessel went out from the area to operate in other areas before re-enter the area,

the operation rate will decrease. Fig. 6 shows the composition of the operation ratio by area and year. There are rather more vessels with high operation ratio in 2006. It means that the vessels, starting their operations in the area, continued operations in the area and did not comeback once they left the area.

Discussion

Because the fishing operation strategy must be a complex process, interpretation of it from the results is quite difficult. It is difficult to distinguish the effect due to the change of the fishery regulation from the change of SBT stock status or change of fishing operational characters which was caused regardless of the change of the regulation rules. Change of other factors, such as oceanographic environments, should be considered. Furthermore, the change of fishing regulation rule including several factors, such as reduction of total allowable catch, introducing of IQ, and abolish of seasonal area closure.

However, several points were found in the RTMP data as follows.

* It should be noted as background information that small fish in catch increased in 2006 and proportion of catch and effort has been concentrating in area 9 in recent years.

* The number of cells operated increased in 2006. It means expansion of time and area ranges that can use for the stock assessment. This is due to stop of the Olympic style competition and abolish of seasonal area closure. In addition, because the number of small fish to the total catch increased, fishing grounds for small fish were also utilized in 2006.

* The number of operations per cell decreased in 2006. This is due to reduction of total catch and increase of the number of cells. Further investigation for the effect of a small number of operations per cell on stock assessment is required.

* Most of the vessels in 2006 are same with the vessels in 2005, as well as for six years. Then, it can be said that their operational character were consistent unless relating to the change of the regulation rules.

* Vessels remained in a fishing ground once entered the area. The strategy of the vessel not seems to move actively in order to make their IQ in most effectively, such as go to other area for other tuna species when catch of SBT were poor and then comeback to the area when catch of SBT by other vessels become better. Rather, they appeared to have a strategy that remain in the area and consume their IQ as soon as possible, as if the economical gain from the SBT catch was the second priority, so that they could go to the area for bigeye or yellowfin tuna soon after. In 2006, price of yellowfin meat was higher than usual years. There is information that buyers wanted SBT so that prices of

yellowfin and bigeye tuna meat were higher if a vessel had SBT. It also should be noted that due to the rapid increase of fuel price prevent active moving of the vessel. From these, there is a possibility that CPUE of SBT become being affected easier by stock statuses of other tuna species, as well as socioeconomic environment of longline fishery.

In 2007, Japanese total allowable catch of SBT is 3000 tons. This is about 70% of TAC in 2006 and less than 50% of TAC in 2005. Japanese industry decided to reduce each IQ and allow to the similar number of vessels to in 2006 go SBT fishing in 2007. Effect of reduction of the total number of operations should be considered. Takahashi (CCSBT-ESC/0509/45) simulated relationship between CPUE trends and reduction of the number of vessels or operations. The result showed that CPUE trends were approximately maintained if the number of vessels reduced to 50 %. But it also pointed out that the trends were different in some age classes. The simulation assumed that the vessels' characteristics and strategies are consistent regardless of the number of vessels, which is not assured so far.

At present, we cannot assume the fishing operation pattern in 2007 will be as same as in 2006. As the second year of the IQ system, because fishermen have already taken into consideration of the IQ for their annual operation plan, there is a possibility that fishing pattern change largely in 2007. Careful monitoring and examination of the data is also required for 2007 operations. RTMP will be conducted also in 2007 and same type examinations in this document will be possible in the future.

References

Itoh, T. 2006. Matters arise from changing of Japanese fishery regulation. CCSBT-ESC/0609/44

Takahashi, N. 2005. Preliminary analysis on effect of changes in fishing pattern on CPUE. CCSBT-ESC/0509/45

Table 1. Number of the cells operated by year, month and area

Area	4								5		6		
Month	4	5	6	7	8	10	11	12	7	8	5	6	7
2001		2	4	4							1	2	1
2002		2	3	6									
2003	1	3	4	4		4	4	4					
2004	2	2	5	6	3				1				
2005	2	2	5	6	1				1				
2006		2	3	4	1				2	3		1	

Area	7							8							
Month	4	5	6	7	9	10	11	5	6	7	8	9	10	11	12
2001	9	6	4	4	2	2	2					11	10	10	
2002	5	6	3	6		3	3					12	13	13	
2003	6	2	2	1	2	1		1				11	13	9	7
2004	2	2	2			1	1	3	4			13	9	9	8
2005	2	2	2					5	5			5	7	8	4
2006		3	2	1	2			1		5	8	7	8	8	7

Area	9						
Month	5	6	7	8	9	10	11
2001	14	20	17	9			
2002	17	14	11				
2003	14	17	15				
2004	19	23	19	12			
2005	25	20	19	13			
2006	21	18	21	15	11	7	4

Shadow denotes the value in 2006 of which much larger than that in 2005.

Table 2. Number of operations by year, month and area

Area	4								5		6		
Month	4	5	6	7	8	10	11	12	7	8	5	6	7
2001		87	559	509							11	13	1
2002		56	1017	807									
2003	2	347	1015	911		96	120	47					
2004	23	447	1179	1110	10				2				
2005	13	731	1122	732	1				6				
2006		530	457	115	3				11	27		1	

Area	7							8							
Month	4	5	6	7	9	10	11	5	6	7	8	9	10	11	12
2001	905	1741	1058	145	71	85	7					1305	1332	1260	
2002	842	1731	588	44		369	183					1335	755	321	
2003	648	1032	254	1	47	1		1				961	842	825	316
2004	530	646	2			6	13	411	104			489	589	904	618
2005	603	397	3					651	13			551	687	821	488
2006		180	66	46	6			12		76	407	270	343	518	259

Area	9						
Month	5	6	7	8	9	10	11
2001	2384	2508	1944	49			
2002	2314	2362	325				
2003	2564	2672	586				
2004	2383	2826	2832	522			
2005	1897	2537	2802	1261			
2006	905	1163	1513	1738	1033	262	24

Shadow denotes the value in 2006 of which much larger than that in 2005.

Table 3. Catch information of southern bluefin tuna in 2006 by year, month and area

Area	Month	N_operation	Mean body weight	Total weight per
4	5	530	54.1	262.6
4	6	457	39.4	280.9
4	7	115	31.2	310.8
4	8	3		0.0
5	7	11	85.0	7.7
5	8	27	26.0	17.3
6	6	1	61.0	61.0
7	5	180	51.5	314.0
7	6	66	23.2	594.1
7	7	46	19.8	607.2
7	9	6	91.3	91.3
8	5	12	42.1	463.3
8	7	76	27.2	335.2
8	8	407	42.3	420.6
8	9	270	55.5	489.6
8	10	343	60.1	281.8
8	11	518	81.6	336.8
8	12	259	83.4	323.0
9	5	905	44.1	230.5
9	6	1163	59.1	213.2
9	7	1513	47.2	306.0
9	8	1738	32.4	307.9
9	9	1033	40.5	265.4
9	10	262	30.7	228.6
9	11	24	30.4	231.5

Table 4. Past experiments of the RTMP vessels in 2006 for the last five years RTMP

Number of years conducted the RTMP during 2001–2005	Conduct the RTMP in 2005	Not conduct the RTMP in 2005	Total
0 year		6	6
1 years	4	4	8
2 years	15	2	17
3 years	9	2	11
4 years	20	1	21
5 years	70		70
Total	118	15	133

Unit: number of vessels

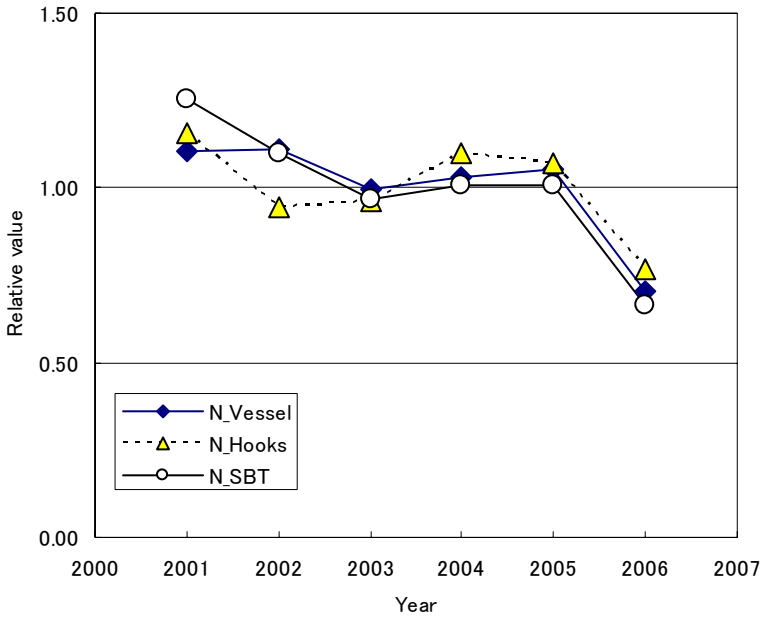

Fig.1. Changes of the number of operation, the number of vessels and the number of SBT caught during 2001 to 2006. Y axis is the relative value to the average of 2001-2005.

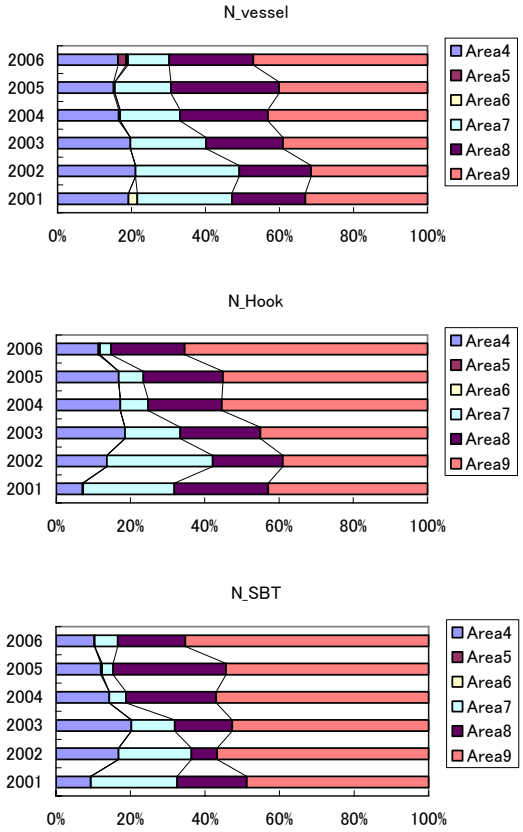

Fig.2. Proportions by CCSBT statistical area for the number of operation, the number of vessels and the number of SBT caught during 2001 to 2006.

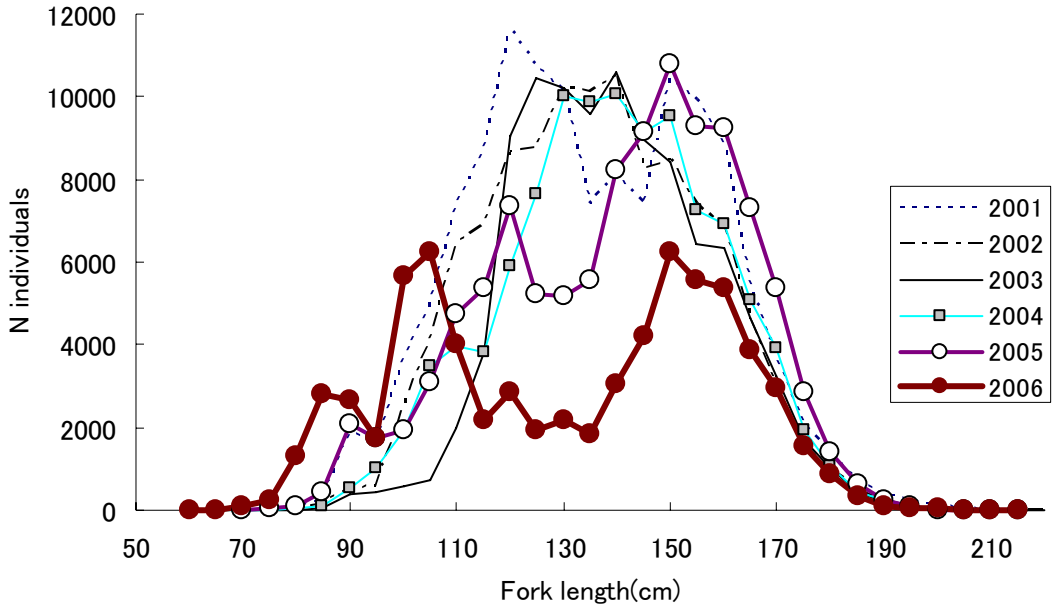

Fig.3. Length frequency distributions of SBT by year during 2001-2006 (all areas).

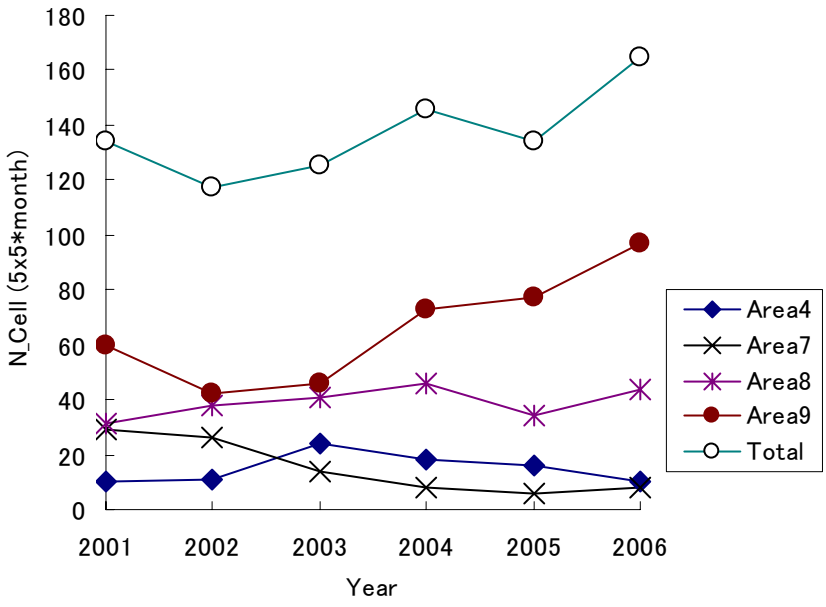

Fig.4. Changes of the number of cells (unit is by 5 degrees latitude and longitude and month) during 2001-2006 in the CCSBT statistical area 4-9.

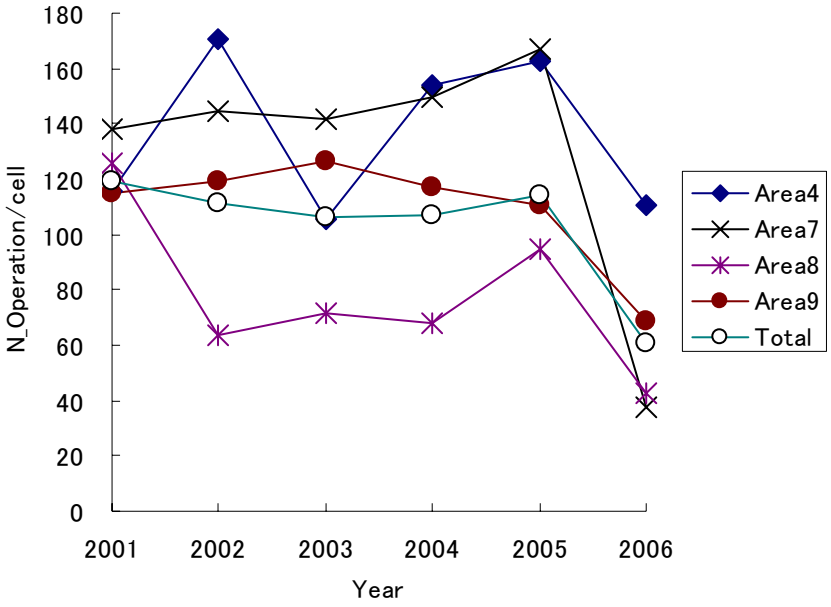

Fig.5. Changes of the number of operations per cell during 2001-2006 in the CCSBT statistical area 4-9

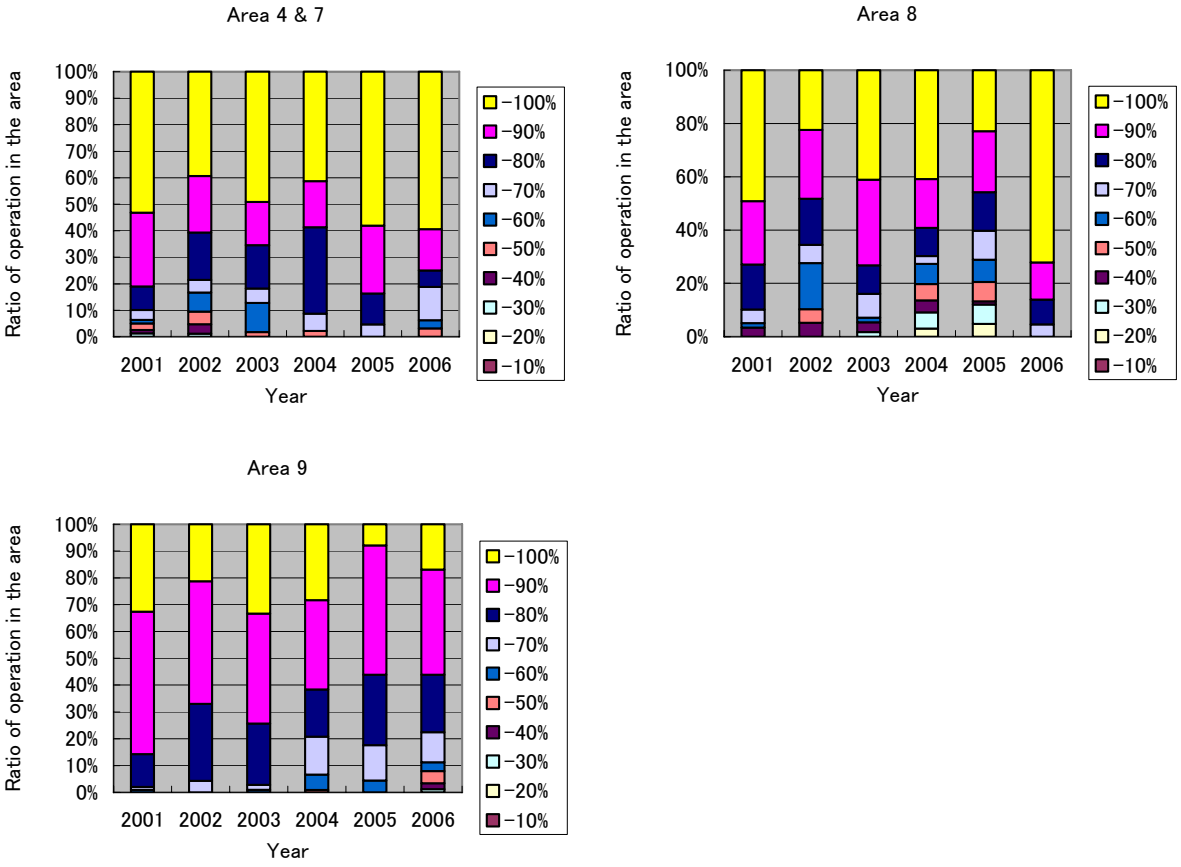

Fig.6. Composition of the operation ratio by area and year