Change in operation pattern of Japanese SBT longliners in 2006 resulting from the introduction of new SBT management system.

新しいミナミマグロ管理制度導入に伴う 2006 年日本延縄船のミナミマグロ操業の変化

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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。漁業管理措置の変更による資源評価への影響を最小限にするために、複数の資源指標を有することが CCSBT での資源評価と管理に急務である。

Summary

In this document, changes in operational pattern of the Japanese SBT longliners resulting from the introduction of the new regulation system in 2006 are examined based on the RTMP data. In 2006, comparing to the averages during 2001-2005, the total number of hooks used by this fleet was decreased to 73%, and the number of SBT caught was decreased to 62%. Proportion of small fish in total catch was larger in 2006. The number of cells operated in terms of 5-degree square was increased in 2006 especially in the area 8 and area 9 due to the lift of the seasonal area closure. On the other hand, the number of operations per cell was decreased to about half of the previous average. Most vessels in 2006 were the same with that in 2005, and no remarkable changes in operational pattern were observed in trying to utilize their IQ as effective as possible. In 2007, because IQ was further reduced and fishermen became more familiar with how to effectively use their own IQ, careful monitoring and examination of the data on the operational pattern should be continued for 2007 season. In order to minimize the effect of a change of fishery management system on the stock assessment, having plural abundance indices from different SBT fisheries is urgent need for the robust stock assessment and stock management in the CCSBT.

Introduction

In 2006, Fisheries Agency of Japan changed the management system for the Japanese longline vessels fishing for southern bluefin tuna (SBT) (Itoh 2006). Individual quota (IQ), which was about 35 tons per vessel, was introduced. At the same time, regulation of seasonal area closures was lifted. In addition, the amount of the total allowable catch was strictly self-regulated. Changes in operational pattern of the Japanese SBT longliners in 2006 resulted from the introduction of the new management system are examined in this document.

Material and method

The RTMP data in 2006 as well as data in 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 are considered to target for SBT. After the catch and effort in 2006 is summarized, changes in 2006 in terms of the area of operation and other activities are examined by comparing them with previous years.

Result

1. Summary of the catch and effort in 2006

Fig.1 shows changes of the number of longline operations, the number of hooks used and the number of SBT caught over the years during 2001-2006 in the CCSBT statistical area 4-9 (below, "Area" means the CCSBT statistical area). In 2006, comparing to the average during 2001-2005, the number of operations was decreased to 66%, the number of hooks used was decreased to 73%, and the number of SBT caught was decreased to 62%. Compared to the values in 2005, all these numbers were decreased in parallel, reflecting the reduction of catch by Japanese self-regulation.

These trends are further analyzed by Area. Fig.2 shows the past change in proportion for the numbers of vessels engaged in fishery and hooks used and SBT caught by Area. Those in Area 9 are the largest and have been increasing since 2001. Decreasing of the proportion is remarkable in Area 7.

Fig. 3 shows the annual length frequency distribution of SBT caught during 2001-2006. Every year since 2001, it is clear that a hollow in length frequencies (very weak cohorts) has been moving through the small fish (at around 80 cm) to intermediate fish (at around 135 cm in 2006). But in 2005, the catch of SBT less than 120 cmFL was larger than in 2004. In 2006, catch of SBT less than 105 cmFL was the largest during the past six years.

2. Changes in the operational area

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 Area 4-9. The total number of cells, where fishing took place, in Area 4-9 in 2006 was the largest during the last six years. In each area, the number of cells operated was increased in the area 9, decreased in Areas 4 and 7, and stable in Area 8.

Table 1 shows the number of cells operated by year, month and Area. No fishing was taken place in April due to the late decision of the 2006 regulation. In 2006, the number of cells operated was increased to some extent in the Area 5 in July and August, fishing was resumed in Area 7 in July and September, and relatively wide areas in Area 8 were fished in July and August. In Area 9, fishing cells reduced in May and June but expanded in July to August, and considerable areas were fished thereafter. In summary, the extension of fishing season was observed especially in Areas 8 and 9.

Table 2 shows the number of operations by year, month and area. Areas 8 and 9 in 2006, especially the latter one indicated significant concentration of fishing operations in August and September.

Fig. 5 shows the changes of the number of operations per cell over the years. The average for all Areas in 2006 was decreased to around a half of those during 2001-2005. In each Area, the number of operations per cell was decreased in 2006 but that in Area 7 was the largest.

The reasons of the shifts in fishing cells as well as the shifts of the amount of fishing operations were considered. Table 3 shows the average body weight of SBT and the total SBT weight per operation in 2006 by Area and month. It is found that the average weight of SBT in the cells where shifts were detected was relatively small, i.e. less valuable in terms of income. However, it is also found that the total catch in weight per operation in those cells were relatively higher. Therefore, the total economical gains were not smaller even though the main component of the catch was small fish. If operations were to occur in those cells before 2006, there would be only small economical gains because there were few small fish in those years. It is interpreted that these cells were actively fished because of the abundant presence of small fish in 2006 as described above.

3. Vessel participation and activities in the SBT longline fishery

Among 133 vessels that caught SBT in the 2006 RTMP data, 118 vessels (89%) did catch SBT in 2005 as well (Table 4). Among the 118 vessels, 70 vessels had engaged in the RTMP activities every year since 2001. Therefore, most of the vessels in 2006 were the same

vessels operated in 2005, as well as for the past five years.

If fishermen decided on their operational pattern only to make their IQ most efficiently, their operational strategies might be different with the previous quota system, i. e. Olympic System. For example, vessels would move actively looking for a good fishing ground for SBT within the Area. Fig.6 shows the average daily moving distance by year and area. It was calculated based on the average daily moving distances by vessel, year and area. The data used were between May and July in Areas 4, 7, and 9 and between September and November in Area 8, respectively. Averages of the daily moving distances were not larger than those in previous years in any of these areas.

Another possibility of strategy change is that, if SBT fishing was quite lower, fishermen leave SBT fishing ground for a while and target on other tunas such as bigeye tuna in other Area to preserve their IQ, and then come back to SBT fishing when SBT fishing improves. This possibility was examined by looking at how much fishing was exerted in the same Area where each vessel started fishing in the Area. Fig. 7 shows the result by Area. In 2006, more than 60% of vessels in Areas 4 & 7 and 8 remained and conducted more than 90% days in the Area. In Area 9, more than 50% of vessels engaged more than 80 % days in the same Area.

Discussion

It is generally understood that the fishing strategy of the Japanese longline boats is not a simple process. Interpretation of the shifts in fishing area, fishing duration and target species from the data is quite difficult. It is especially difficult to distinguish the changes whether or not this was caused from the changes in fishery management system. Oceanographic conditions might also be related together with all other factors.

However, several points were noted based on the RTMP data as follows.

* In 2006, small fish were more abundant and larger part of the fleet in Area 9 had continued to target on this portion of the stock.

* The number of cells operated was increased in 2006. Resulted from the changes in quota system (smaller quota) and regulations (a lift of seasonal closure), fishing activities were conducted in some strata that were not fished before. Towards the end of fishing season, some boats concentrated on the small fish as they probably had no other choice to fill up their quota.

* The number of operations per cell was decreased in 2006. This is due to reduction of total catch and increasing of the number of cells. The effect of a reduced number of operations per cell over the stock assessment results may need further investigation.

* Most of the vessels in 2006 are the same as those vessels in 2005, as well as for the past six years. If there were not a large impact from the changes in the regulation, operational patterns would be similar.

* Vessels tended to remain in the same fishing ground once entered the area. The strategy the vessels took seems not to move actively in finding better fishing spot for SBT in the Area nor change their target species frequently by moving across Areas often. This tendency might have related to the high fuel cost in recent years. In 2006, price of yellowfin meat was higher than usual years. There is information that buyers paid higher price for yellowfin and bigeye tunas if a vessel sold SBT together with other tunas. There might be some influence from the recent bad economic situations for longliners. It was reportedly said that fishers with large debt are asked to provide their catches to the market irrespective of the species and size of the fish.

In 2007, Japanese total allowable catch of SBT is 3000 tons. This is about 70% of TAC in 2006 and less than 50% of Japanese TAC in 2005. Japan decided to reduce IQ and allowed to operate fishing in 2007 as similar number of vessels as in 2006. Effect of the reduced number of operations should be carefully investigated and taken into consideration in the assessment. Takahashi (CCSBT-ESC/0509/45) simulated a relationship between CPUE trends and reduction of the number of vessels or operations. The result showed that CPUE trends were approximately maintained until when the number of vessels reduced to 50 %. But it also pointed out that the trends could be 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 verified so far.

At present, we cannot assume that the operational pattern in 2007 will be similar as in 2006. As 2007 is the second year after Japan introduced the IQ system, fishermen have already thought about how best they can use their IQ in making their operational plan, there is a possibility that fishing strategy will change largely in 2007. Continued careful monitoring and examination of the data is also required for 2007 operations. RTMP will continue in 2007 and the similar examinations shown in this document will be necessary in the future.

Stock status assessment on SBT in the CCSBT has been relying excessively on CPUE of the Japanese longline fishery. Then, a change in the domestic management system of the Japanese SBT longline fishery has a possibility that puts some difficulties on the stock assessment of SBT, even if the change in the domestic management system is good for SBT stock or fishery. It is preposterous to hesitate to strengthen SBT fishery management in order to maintain the means for the stock assessment. Effects of the change in the management system for the Japanese SBT longline could be evaluated through comparison between the abundance index from Japanese longline and other reliable abundance indices from other SBT fisheries. Having plural abundance indices from different SBT fisheries is

urgent need for the robust stock assessment and stock management in the CCSBT.

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

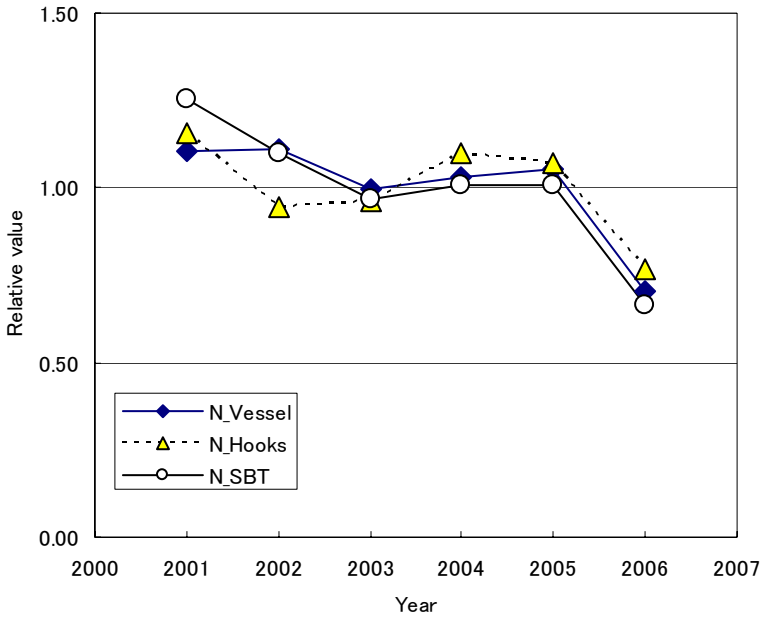

Fig.1. Changes of the number of operation, the number of vessels and the number of SBT caught during 2001 to 2006. Y axis is the relative value to the average of 2001-2005.

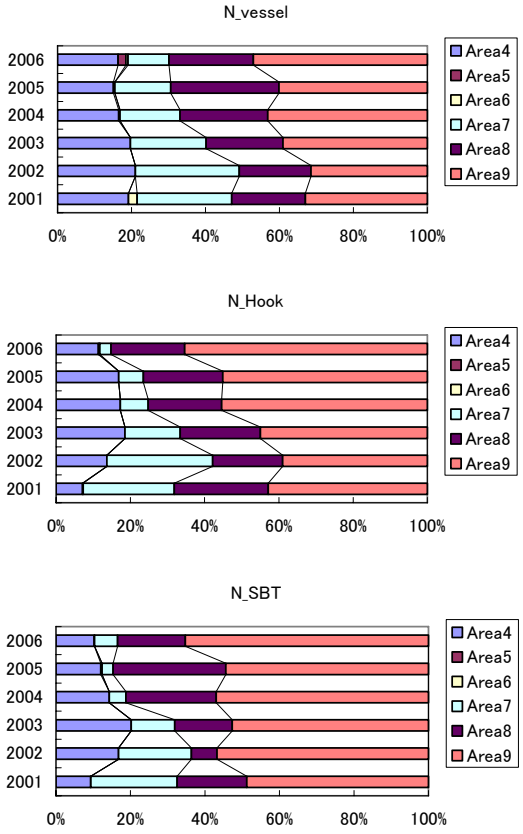

Fig.2. Proportions by CCSBT statistical area for the number of operation, the number of vessels and the number of SBT caught during 2001 to 2006.

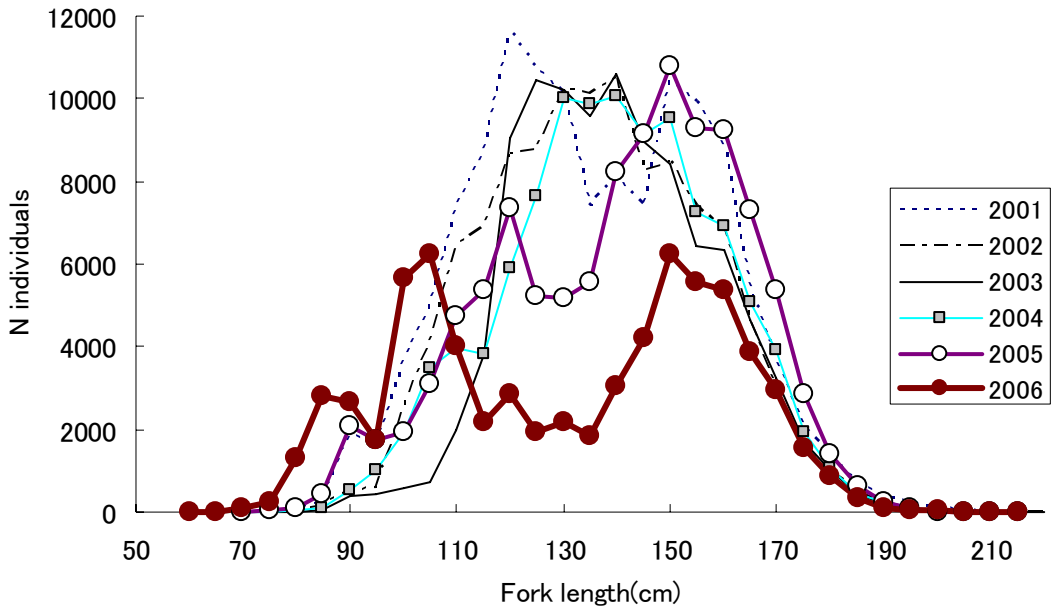

Fig.3. Length frequency distributions of SBT by year during 2001-2006 (all areas).

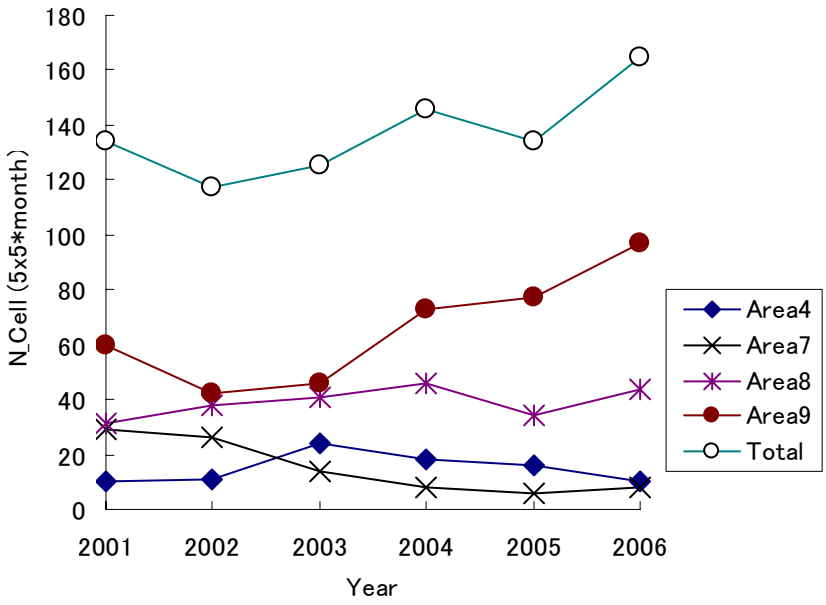

Fig.4. Changes of the number of cells (unit is by 5 degrees latitude and longitude and month) during 2001-2006 in the CCSBT statistical area 4-9.

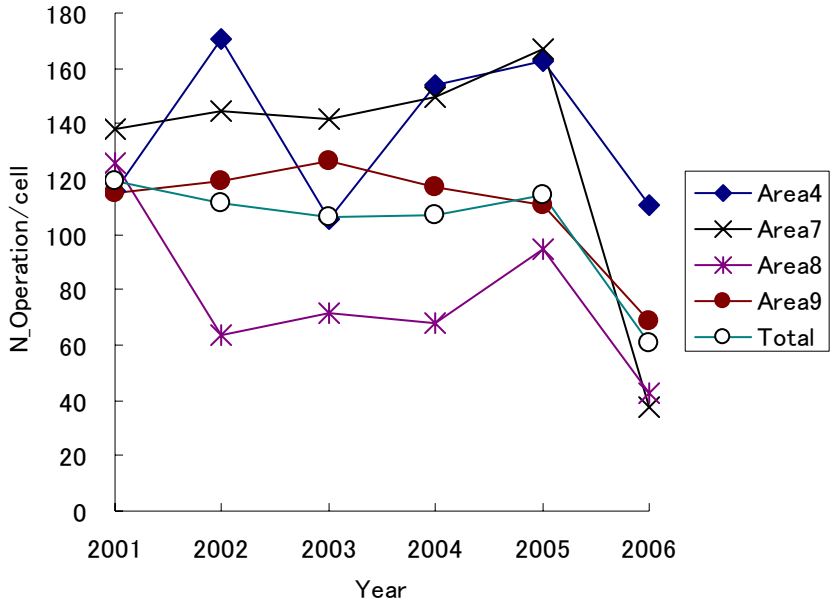

Fig.5. Changes of the number of operations per cell during 2001-2006 in the CCSBT statistical area 4-9

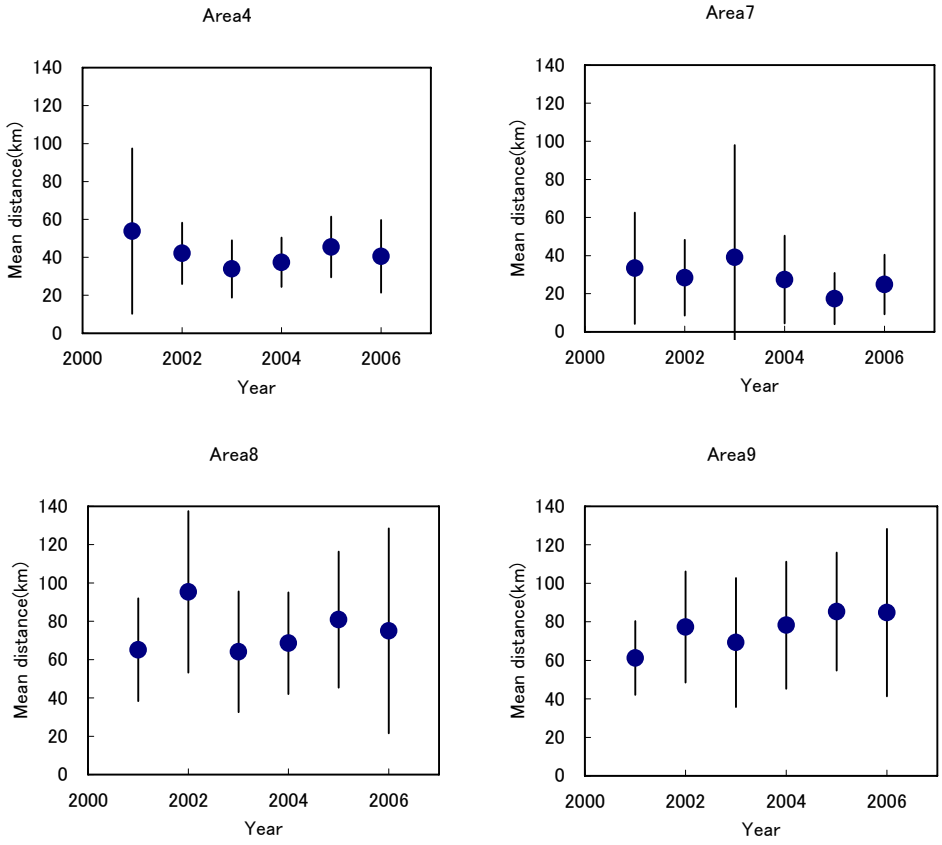

Fig.6. Average daily moving distance by year and month. The average and standard deviation (bar) are calculated from average daily moving distance by vessel.

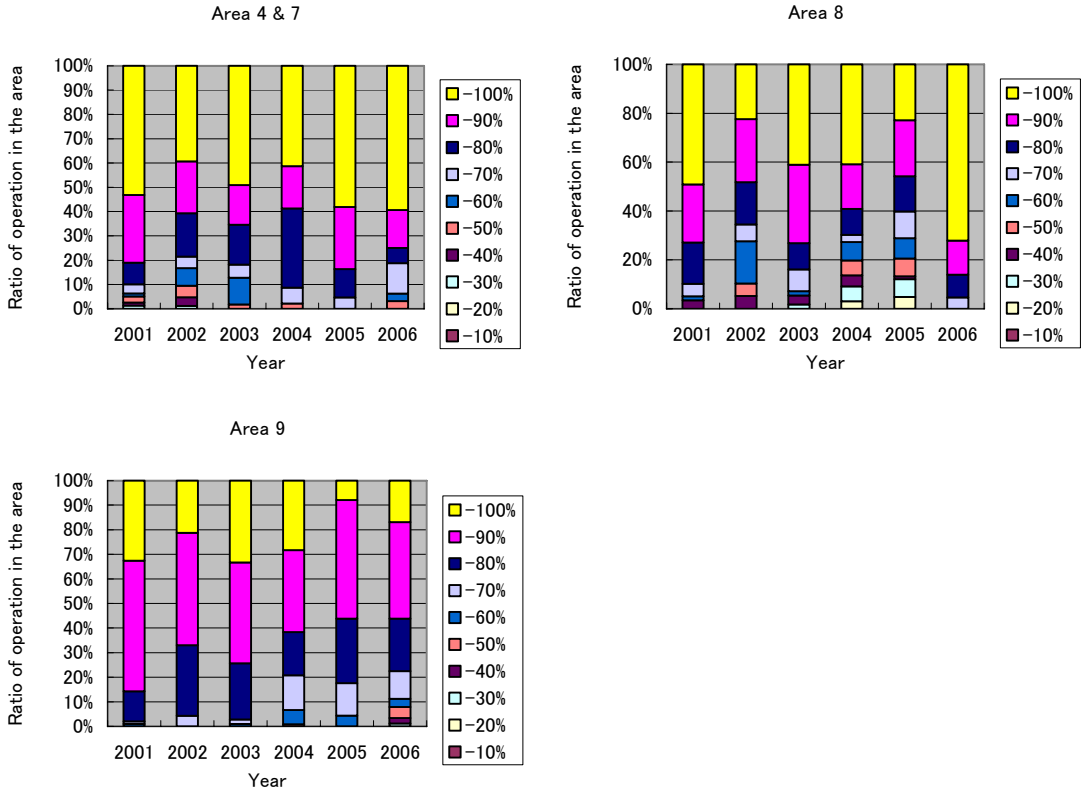

Fig.7. Composition of the operation ratio by area and year