STUDY ON FISHERY HOUSEHOLD MANAGEMENT IMPROVEMENT BASED ON INTERACTIVE INFORMATION SYSTEM

Making distribution efficiency increase of snow crab chionoecetes opilio
using IC tag into example

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ABSTRACT

This paper presents a introduction of the developed system by that fisherman share various information. This system is characterized by the application of data mining methods and the introduction of IC tags. We compute the predict price formula by data mining of product value. The predict price of each port market can help a fishing boat to select a port for landing. And a part of this information is provided for market brokers. A fisherman and market brokers can perform their activity efficiently using this system. And we researched the influence to which adding products information to marine products gives a consumer using IC tag. This IC tag has boilable, multi-access, and rewritable function. We wrote several information in IC tag, such as catching day, catching point, catching boat and so on, and .researched an effect of adding information to consumers by the questionnaire In this paper, we introduce the method of this investigation, and a part of result. In addition, we select the offshore trawl net fishery in Tajima, Hyogo Prefecture as a model area.

Keywords: IC Tag, Distribution Efficiency, Interactive Information, Tajima

1. INTRODUCTION

In recent years, catch quantities is decreasing and products price is low level. Then fisherman is called on to be active efficiently and rationality. But, neither about fishery point selection nor landing port selection, rational action is necessarily chosen. One of the causes of this is in the point that the information between fishery cooperative associations is not common.
In this research, we take the offshore trawl net fishery in Tajima as the model object, and developed the system that can select a fishery point and landing port rationality by Informational sharing. Moreover, we provide market brokers with a part of these information, and attempted rationalization and stabilization of products dealings. And, we investigated the influence on a consumer to adding product information to goods.
However, for the moment, we can't report sufficient effect, because this research is under continuation now.
Then we introduce the built system, and report the method and the result of that the experiment for adding information to goods.

2. The outline of the fishery in TAJIMA

First, I introduce the outline of the fishery in Tajima, that we select as model area. The Tajima area is located at the Sea of Japan in Hyogo Prefecture. In this area, there are 5 fishery cooperative associations, which are Tsuiyamakou, Takenohama, Shibayamakou, Kasumichou, Hamasakachou.
In fishery production of the Tajima area, the catch quantity and the product value are decreasing. The catch quantity is decreasing 31%, and the product value is decreasing 26% in these ten years. The quantity in 2002 is 18,330t and the value is 9,692million yen.

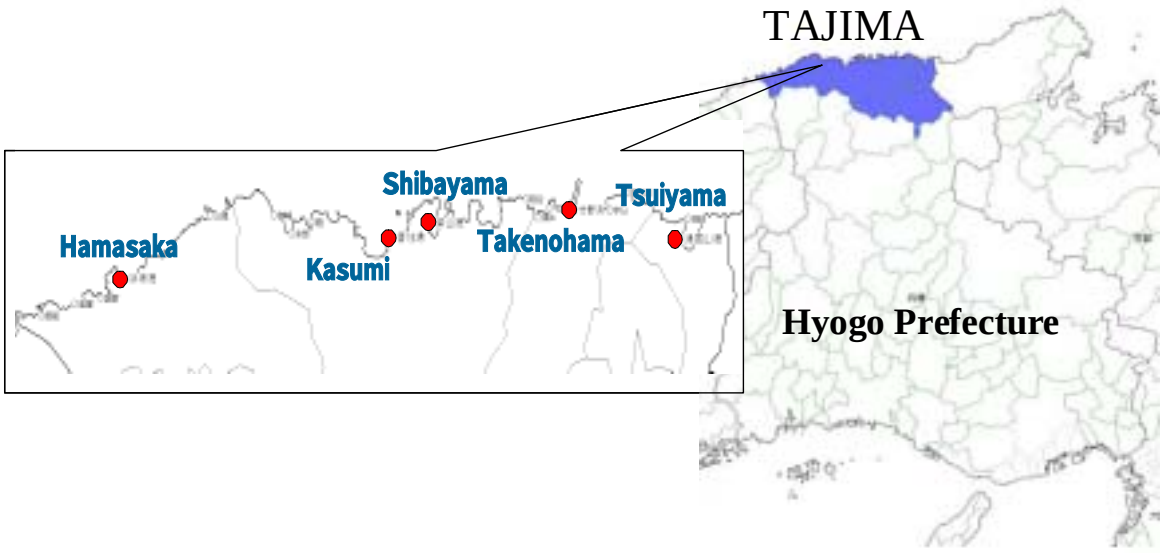

Figure 1. The position in the Tajima area

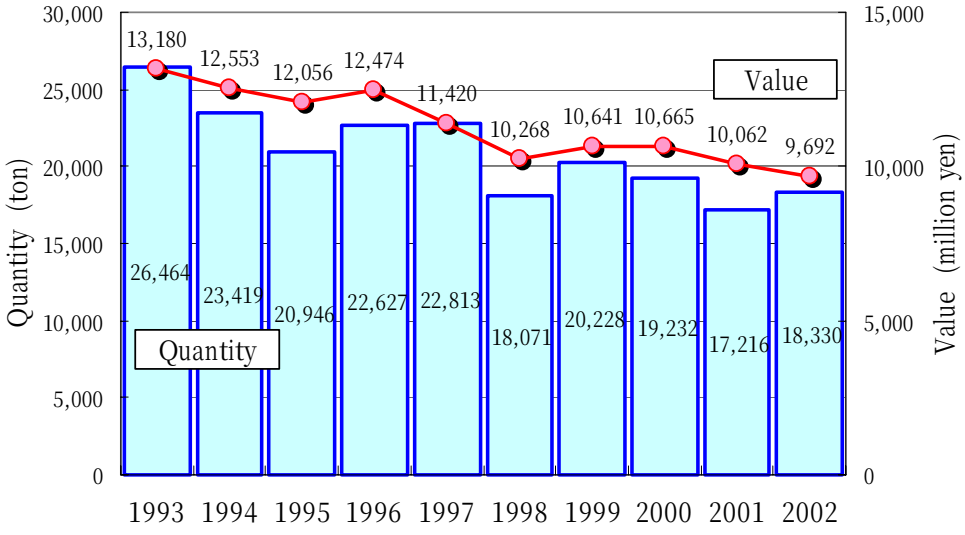

Figure 2. Transition of the fishery quantity of production in Tajima

The main fishery in Tajima is offshore trawl net fishery. The catch quantity of this accounts for 54.0%, and the value of this accounts 72.9% of the total. But the number of the operation boats of offshore trawl net fishery is decreasing sharply in recent years, reduced by half during these 30 years.Figure 4.shows

the operational schedule of offshore trawl fishery. The offshore trawl fishery is performed from September to May. The fishing season of the snow crab is in May. And the removal-of-the-ban season of the snow crab fishery, which is the prime fish of this fishery is from November 6 to March 20. During this period, a snow crab is caught intensively, and at time other than this, flounder, sand fish, shrimp, firefly-squid are caught.

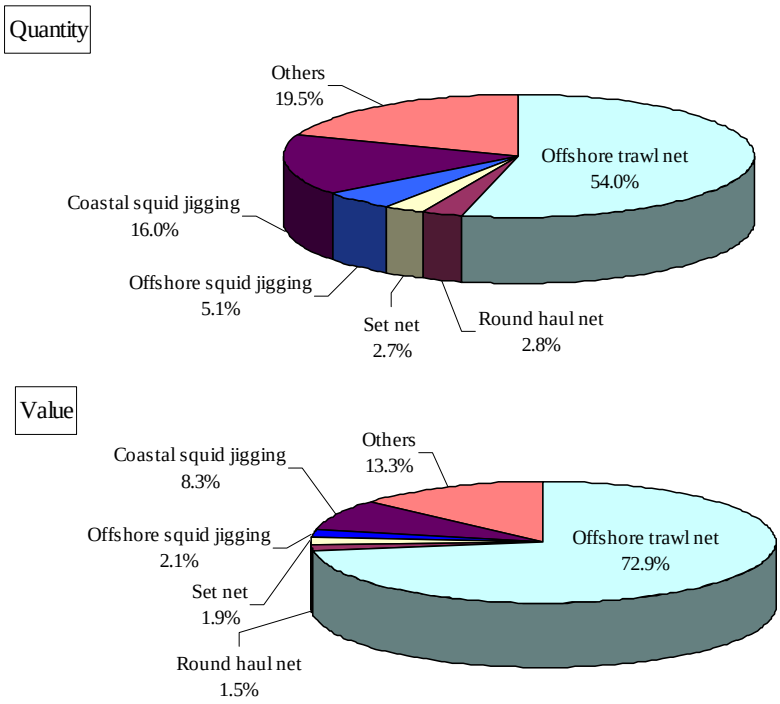

Figure3. Percentage of catch quantity and value by every fishery in TAJIMA

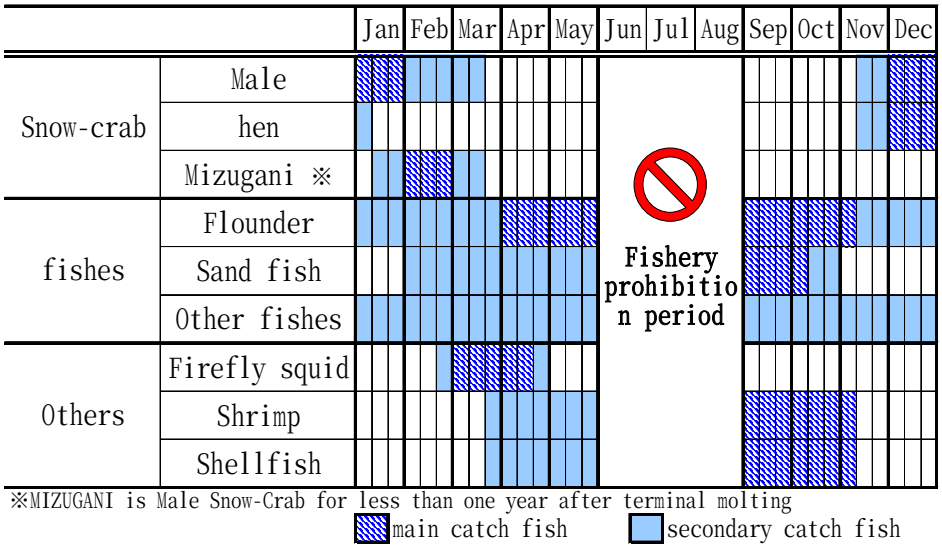

Figure 4. The operational schedule of offshore trawl fishery

Figure5 shows the transition for these thirty years of catch quantity and average-unit-price of snow crab in Tajima. About the catch quantity, It decreased sharply from the middle of the 80s, but since the effect of control for resources management, it was recovered from the middle of the 90s. The tendency for an average unit price is in inverse relation to the products quantity. In this figure, it has classified into “Male", “Hen", "MIZUGANI“. A remarkable differential is seen among these. In addition, "MIZUGANI" is Male snow crab for less than one year after terminal molt. The market valuation of MIZUGANI is low, because filling is not good.

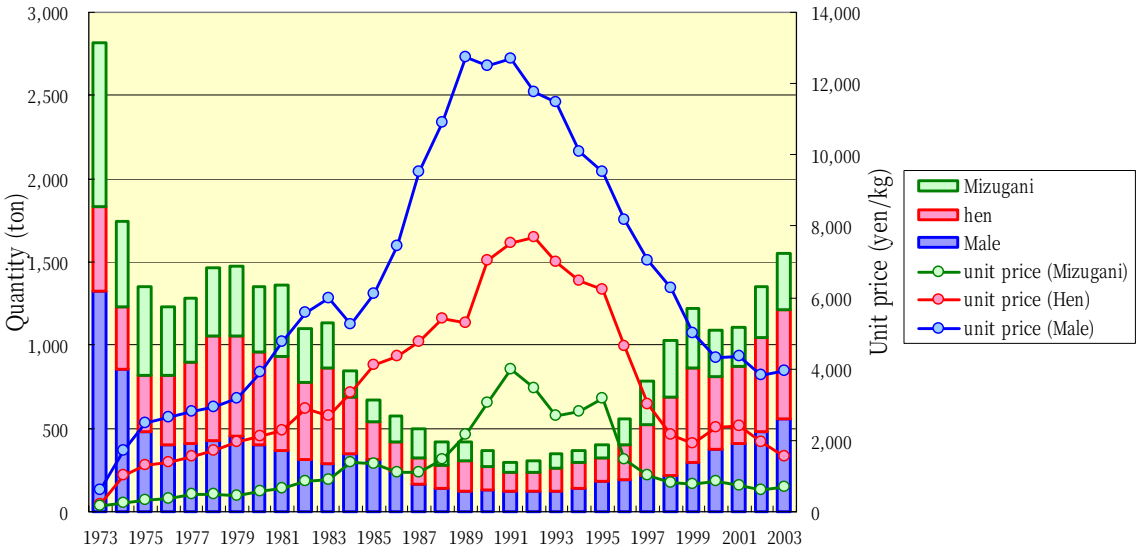

Figure 5. Production quantity and unit-price of snow-crab in Tajima

3. Interactive information system and functions

Figure6 shows the image of the system. The information reported to fishery-coop from each fishing boat by radio or telephone is collected in the server center. The PC set up at each fishery cooperative association is connected to the Internet, and this information can be seen freely using PC. Moreover, fisherman or market brokers in Tajima, can be seen a part of information using the Internet or a cellular phone.

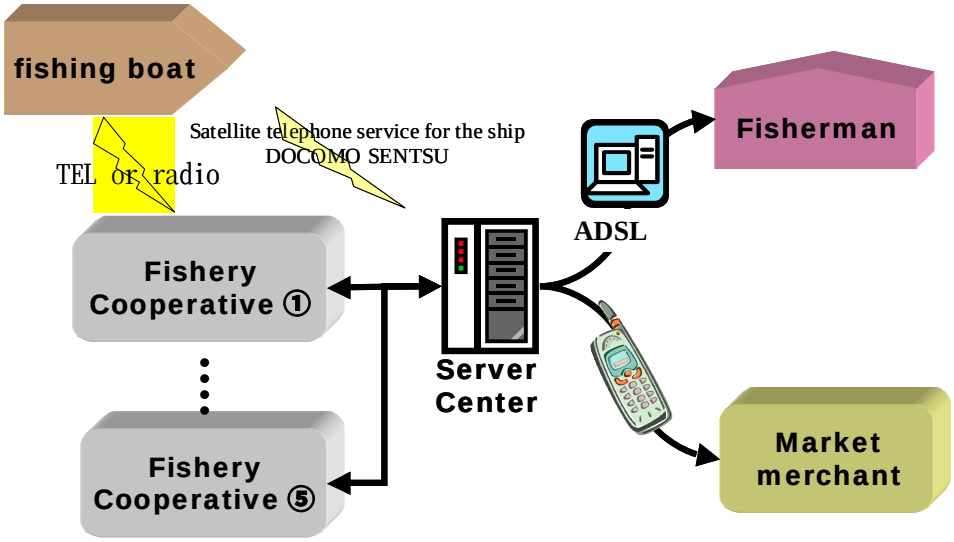

Figure 6 Interactive information System

Figure7 shows the four functions in this system.

Guidance for fishing place	Record fishing place information,and provide fishermen with useful information.
Guidance for selecting landing port	Collect the reports of the expected arrival information ,and provides fishermen and market brokers with this information.
Market information	Provide the market price information and prediction price of main fish.
Adding product information	Program system for writing individual product information to IC Tag.

Figure 7 Four Function of system

4. The method of data mining of a snow crab price

(1) The method of data mining

Product price is one of the most important elements for which fisherman select a landing port. This system predicts the price of snow crab, and provides it for fisherman. We introduce the method of price prediction simply. The price of snow crab is prescribed by various elements. For example, it is the size, quality, season, a day of the week, and the price movement for the past several days.
We analyze the determinative mechanism of snow crab price, using the market selling data for the past three years, from 2000year to 2002 year.

(2) The result of price analysis

The following analysis results were obtained from the tendency of the past price.

① Price transition was showed a different tendency among " Male", " Female", and "Mizugani ".
② The individual price in each brand was mostly determined by size.
③ The difference was found by the tendency of price transition between fishery cooperative associations.
④ A price is strongly influenced of seasonal.
⑤ The influence by the day of the week was seldom seen.
⑥ About the relation between the quantity of production and a price, the relation with the quantity of production of the accumulation for the past several days was stronger than the quantity of production on the day.
⑦ The big gap appeared in the price level by the year.

(3) Procedure of predict price formula

Then, we compute predict price by the following methods, using the result, which analyzed the price of snow crab.

① We computed predict price about three brands respectively.
② We computed predict price for every fishery-coop.
③ The basic formula of predict price was computed by the seasonal tendency of price transition.
④ We rectified the predict price formula by the accumulative landing quantity for the past seven days.
⑤ We adjusted the price level gap in years, by the price transition of this year.

Figure8 is the formula of the predict price in the case of Shibayama market in Nov. The predict formula consists of three influence parts. One is the seasonal price tendency, which is yellow part. The second is the adjustment by the accumulative landing quantity for the past seven days, which is orange part. And the third is the adjustment by the price level gap in years, which is green part. The adjustment by the price level gap in years computes accumulative predict price for 5days by accumulative real price for 5deys.
The predict price formula for every fishery cooperative association, and every month, is as being shown in table1.
The system provided fisherman with the predict price, as information for the judgment of landing port selection.

$$P = \left\{ -0.0571 \times \left(-0.391Q^3 + 19.11Q^2 - 266.7Q + 4865 \right) + 337.1 \right\} \times A$$

P : Predict price
Q : Landing quantity
A : Adjust index

A = (accumulative predict price) / (accumulative real price)

Figure 8 The formula of the predict price about snow crab
(In the case of Shibayama market in Nov)

Table 1 Predict price formula of male snow crab

Fishery cooperative association	Month	seasonal tendenncy	Adjustment by the accumulate quantity for the past seven days
Tsuiyamakou	NOV	y = -0.0466x3 + 9.6613x2 - 270.91x + 4997.4	y = -0.0527x + 418.72
	DEC	y = 0.0632x3 - 2.4263x2 + 103.78x + 3216.8	
	JAN	y = -0.5908x3 + 30.17x2 - 442.52x + 5819.5	
	FEB	y = 0.558x3 - 26.609x2 + 266.97x + 3804	
	MAR	y = -0.5152x3 + 4.726x2 + 76.789x + 2330.2	
Sibayamakou	NOV	y = -0.3917x3 + 19.113x2 - 266.71x + 4865.2	y = -0.0573x + 337.18
	DEC	y = -0.1801x3 + 4.0089x2 + 121.41x + 4380.2	
	JAN	y = -0.3407x3 + 23.661x2 - 436.13x + 7151.	
	FEB	y = 0.3104x3 - 11.38x2 - 1.9996x + 5362.5	
	MAR	y = -0.6499x3 + 11.136x2 + 23.018x + 2681.1	
Kasumichou	NOV	y = -0.3731x3 + 16.673x2 - 218.71x + 4614.9	y = -0.0158x + 37.957
	DEC	y = -0.7266x3 + 31.209x2 - 252.9x + 4427.4	
	JAN	y = -0.3659x3 + 27.84x2 - 507.74x + 6029.6	
	FEB	y = 0.4867x3 - 19.903x2 + 184.46x + 4378.5	
	MAR	y = -1.4999x3 + 40.137x2 - 335.29x + 4660.4	
Hamasakachou	NOV	y = 0.4288x3 - 18.565x2 + 242.54x + 3024.1	y = -0.0352x - 101.87
	DEC	y = 0.0538x3 - 10.315x2 + 386.95x + 3306.5	
	JAN	y = -0.0839x3 + 18.496x2 - 527.86x + 7792.4	
	FEB	y = -0.4944x3 + 20.031x2 - 235.15x + 4551.7	
	MAR	y = -0.1863x3 - 5.8262x2 + 145.2x + 2738.7	

5. Adding production information research

(1) Research method

Finally, I explain the research method of the influence that Adding product information to products has on a consumer.
Figure9 is a research method of adding product information system.
Fishery cooperative association staff records product information in IC tag, by using expected arrival information. And sale crabs with IC tag at fishery market. At stores or tourist homes, we display information in IC tag to customers, and carries out a questionnaire survey about IC tag.
Then, we analyze questionnaires.
Figure10 is machineries used for this experiment. Considering about the characteristic of the use of snow crab, we selected the IC tag, which is excellent in water resistance and heat resistance.

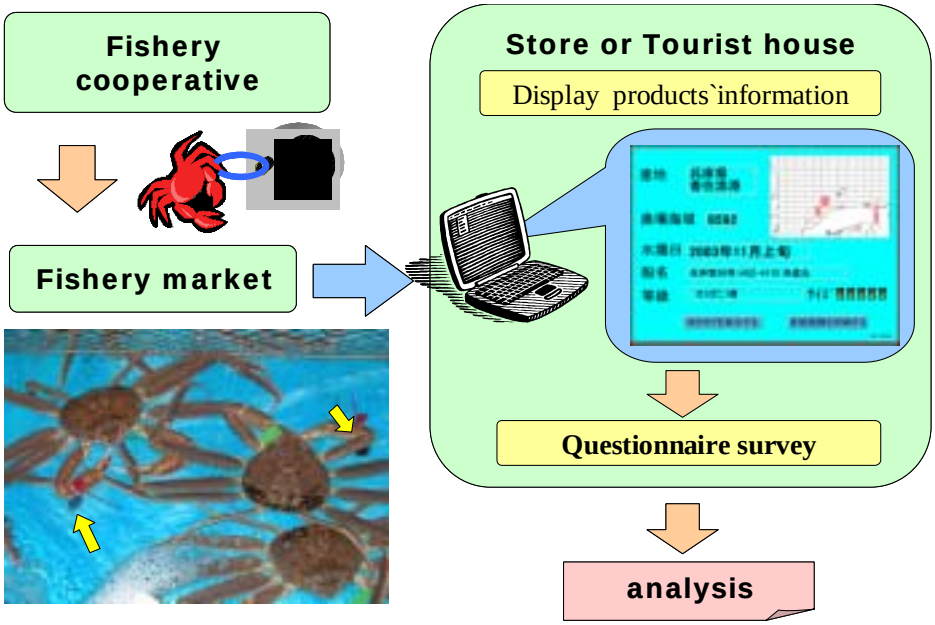

Figure 9 Adding product information systems


IC tag


Information writer


Notebook PC for display

Figure 10 Machineries for experiment

(2) Questionnaire result

Here, I introduce a part of consumer questionnaire result.
Figure11 is the result of the question about valuation for IC tag. Respondents who answer that IC tag is good for eating at ease accounted for about 80% of the total. On the other hand, the respondents who answer it's good for getting goods information or fisherman information was as low as 20% or less.
That is, the consumer expects sense of security rather than actual information for IC tag. That is, a consumer can say that he is asking IC tag for sense of security from concrete goods information.
That is, the consumer expects security rather to IC tag from concrete goods information.
Figure12 is the result of the question, what consumer request for IC tag. The respondent who requests for the information of catch place is relatively high, about 60% of the total. But responded who requests for catch day, catch fisherman, landing port, and quality is each only 30～40%.
It cannot be overemphasized that the opinion of a consumer is very important information, when we aim for the improvement of product price. The system also has the function to offer the consumer information to fisherman and fishery cooperative association.

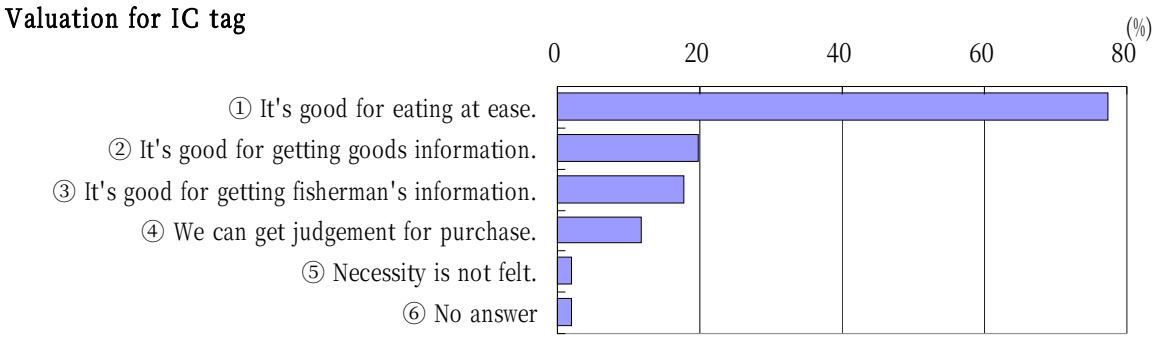

Figure11. Questionnaire result about valuation for IC tag

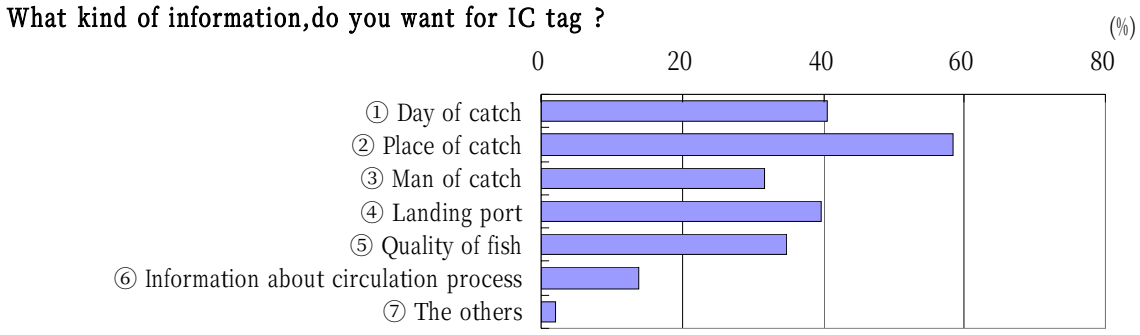

Figure12. Questionnaire result about information requested for IC tag

6. Conclusion

The information system developed with this investigation enterprise was already completed as a system. But it is not a stage that measures a project effect quantitatively, since the system was just introduced. Therefore, it changes into a conclusion; I describe the synthetic working image of this system.
A plenty of information was common by introducing this system. Sharing information rationalizes fishery action, and contributes to the stabilization of fishery management. The system gives consumers goods information, and they can choose safety food. Furthermore, the office worker in fishery cooperative association can work efficiently by using this system, and stabilization of the management is realized.
But now, the situation that fishery action changed sharply by using a system has not been born. However, the merger of fishery cooperative association is discussed in the Tajima area now, and when this is realized, various effect is expected.
On the situation, which a fishery reduces, the fishery management must be rationalizing. For that purpose, it is thought that sharing information is the most effective step.

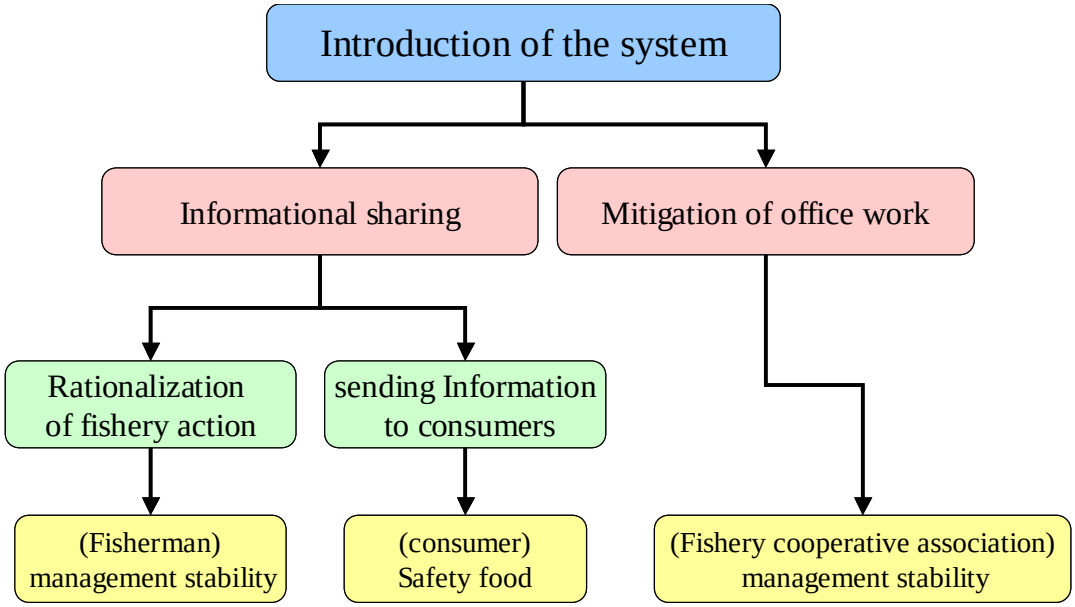

Figure13 The synthetic working image of the system