

UiT

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## Co-operatives in small-scale aquaculture

*A case study of the yellow croaker aquaculture fishery in Ningde City of Fujian Province in China*

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**Cover picture:**

Showing the community of large yellow croaker aquaculture fishery with fishing raft made of fishing cages in Ningde City, Fujian, China. The picture is downloaded from Mail Online: <http://www.dailymail.co.uk/news/article-2451023/Chinas-Tanka-boat-peoples-floating-homes.html>

## Table of Contents

Table of Contents .....	ii
List Of Figures .....	iv
List Of Tables.....	v
Abbreviations and Acronyms .....	vi
Acknowledgement.....	vii
Abstract.....	viii
<b>Chapter 1 Introduction.....</b>	<b>1</b>
<b>1.1 Background.....</b>	<b>1</b>
1.1.1 Collapse of marine resources .....	1
1.1.2 Rise of aquaculture.....	2
1.1.3 Global distribution of fisheries workers.....	3
1.1.4 Organization and collective action and fisheries cooperatives .....	4
1.1.5 The large st aquaculture country-China .....	5
<b>1.2 Research questions, methods and frameworks .....</b>	<b>7</b>
1.2.1 Questions.....	7
1.2.2 Methods.....	8
1.2.3 Framework .....	8
<b>Chapter 2 Organizations and collective action in fisheries.....</b>	<b>10</b>
2.1 Specification of global fishery.....	10
2.2 Specification of fisheries workers in SSF .....	12
2.3 Strengthen organizations and collective action in SSF .....	13
2.4 Elements in organizations and collective action.....	14
2.5 Fisheries cooperatives .....	17
<b>Chapter 3 Governance and governability .....</b>	<b>20</b>
3.1 Theory and components.....	20
3.2 Importance of governing interaction.....	21
<b>Chapter 4 Governability assessment of a case study of large yellow croaker aquaculture fishery in Ningde City, China .....</b>	<b>23</b>
<b>4.1 Background of LYC aquaculture fishery.....</b>	<b>23</b>
4.1.1 Natural advantage .....	23
4.1.2 Culturing equipment and scale .....	24
4.1.3 Fish farmers and stakeholders.....	25
4.1.4 Governors and their responsibility .....	26
<b>4.2 Export crash in 2007 and its impacts.....</b>	<b>28</b>
4.2.1 Main factors causing the crash.....	29
<b>4.3 Implementation of fisheries cooperatives approach in governance of LYC aquaculture fishery.....</b>	<b>31</b>
4.3.1 Goals .....	31
4.3.2 Measurements.....	33
4.3.3 Outcomes.....	37
4.3.4 Relation changes in fish farmers, stakeholders and governors.....	38
4.3.5 Interactions between fish farmers, stakeholders and governors.....	40
<b>4.4 Summery.....</b>	<b>42</b>
<b>Chapter 5 Discussion.....</b>	<b>43</b>

<b>Chapter 6 Conclusion .....</b>	<b>47</b>
<b>Reference.....</b>	<b>51</b>

## List Of Figures

Figure 1 World fish utilization and supply (FAO, 2014) .....	1
Figure 2 World capture fishery and aquaculture production (FAO, 2012).....	2
Figure 3 Interactive governance perspective of a societal system (Maarten <i>et al</i> , 2013).....	21
Figure 4 View of LYC aquaculture fishery in Ningde City, China (NDFA, 2015) ...	24
Figure 5 Geographic label of LYC in Ningde City, China(NDFA, 2015).....	37

## **List Of Tables**

Table 1 matrix of governability assessment.....	22
Table 2 STOW analysis of fisheries cooperatives approach in SSF.....	44

## **Abbreviations and Acronyms**

FAO	Food and Agriculture Organization
GAP	Good Aquaculture Practices
GSP	Good Safety practices
ICA	International cooperative alliance
LCY	Large yellow croaker
MCS	Monitoring, Controlling and Surveillance
NDFA	Ningde City Fisheries Association
NOFB	Ningde Ocean and Fisheries Bureau
SSF	Small-scale fishery

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## **Abstract**

The SSF contributed a lot to the whole world for hum food consumption and employment. However the problems of poverty and food safety and security in SSF also catch many people's attention to their livelihood now and in future. Coupled with the fish resources collapse in coastal area and the decrease of use of Coastal for fishing, their situation become worse. FAO recommended the fisheries cooperatives approach that is one of forms of organizations and collective action to help the governance in SSF. But the mixed records of fisheries cooperatives in history negatively impact their governance in SSF.

The problems I am trying to solve in this paper is what are the effects of fisheries cooperatives impact on SSF governances, what can sustain a fisheries cooperative in the changing world to achieve a long term governance by fisheries cooperatives and the importance of the interactions functioning in the SSF governance. A governability assessment of large yellow croaker aquaculture fishery in Ningde City, China is applied in this paper to analyze the effects of fisheries cooperatives on SSF governance at the natural, social, economical and political perspectives. Then discussion of the advantages and disadvantages of fisheries cooperatives would be presented by a SWTO analysis. Finally, the result is that it is not difficult to organize and function a fisheries cooperatives and key points to sustain their life are constant innovation with the changing of the world and participation of all people involving in the SSF.

## Chapter 1 Introduction

### 1.1 Background

With the growing number of human population on the earth, demand for food is increasing on both quality and quantity. Food fish supply increasing at an average annual rate of 3.2 percent, outpacing world population growth at 1.6 percent (FAO. 2014). Fish, either produced through fish farming/aquaculture activity or caught from wild marine or freshwater stocks, is a primary source of protein and essential nutrients, and there is a growing recognition of its nutritional and health-promoting qualities (HLPE, 2014).

In many people's daily meals, fish more or less is a part of their food consumption. World per capita apparent fish consumption increased from an average of 9.9 kg in the 1960s to 19.2 kg in 2012 (FAO. 2014). Moreover, fish is also a major source of livelihoods and income, particularly in developing countries (HLPE, 2014). In somewhere on the world, people are highly dependent on fish to maintain their life or find a way out of poverty. Fish is not only their main daily food, but also bring them the income for other living cost.

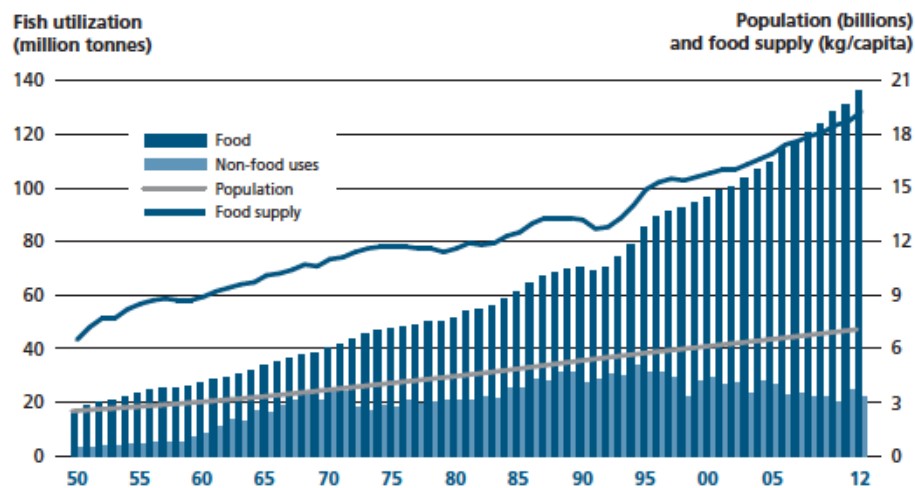


Figure 1 World fish utilization and supply (FAO, 2014)

#### 1.1.1 Collapse of marine resources

However, the situation of wild resources is opposite to human's demand and expectation. FAO categorizes fish stocks either as underexploited, moderately exploited, fully exploited, overexploited, depleted or recovering. Analyses of

world marine stocks show an increase in the percentage of overexploited and depleted stocks over time, while the number of underexploited or moderately exploited stocks decreases (HLPE, 2014). Meanwhile, overall global capture fisheries production continues to remain stable at about 90 million tonnes (FAO, 2012).

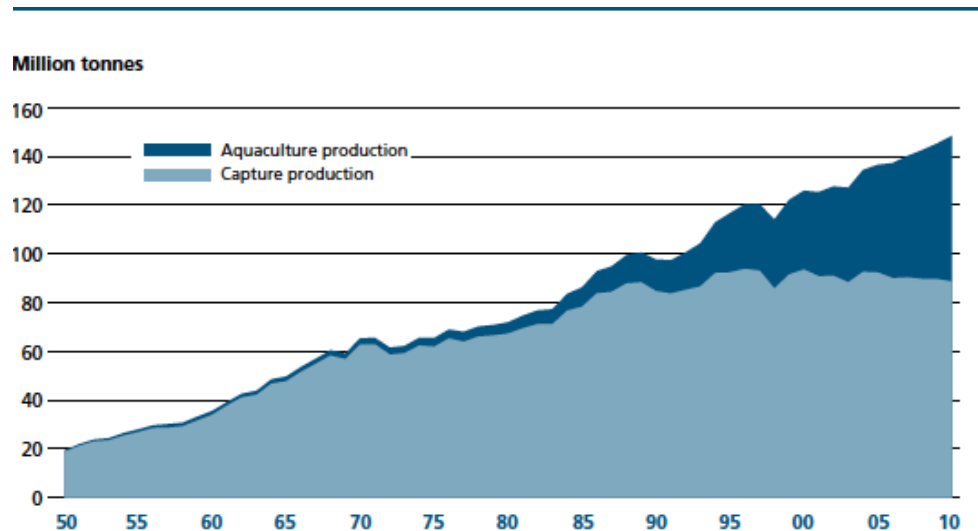


Figure 2 World capture fishery and aquaculture production (FAO, 2012)

### 1.1.2 Rise of aquaculture

So it seems that it is impossible to meet the increasing of fish demands only by capture fishing productions, not to mention that parts of that are not produced for directly human consumptions. It is now widely recognized that the foreseen future increase in demand for fish will have to be satisfied through aquaculture production (HLPE, 2014). In the last three decades, aquaculture has already shown us its giant productivity. According to the latest available statistics collected globally by FAO, world aquaculture production attained another all-time high of 90.4 million tonnes (live weight equivalent) in 2012 (US\$144.4 billion), including 66.6 million tonnes of food fish (US\$137.7 billion) and 23.8 million tonnes of aquatic algae (mostly seaweeds, US\$6.4 billion) (FAO, 2014). The contribution of small-scale aquaculture (SSA) to sustainable rural development (SRD) include, for example, securing food, efficient use of water, farm materials and other resources, creating wealth, diversifying livelihoods, generating rural employment and income, utilizing family labor, fostering social

harmony and empowering women (Bondad-Reantaso & Prein, 2009). It can be seen that small-scale aquaculture almost active in all parts in fish production. It is a complete chain of fish production.

However, the achievement on production yield of aquaculture cannot cover the problems as a result of its over-rapid development and mismanagement. The unstable quality of fish products, pollution to environment due to misusing of fishmeal and fish medicine, and insecurity of fish farmers' livelihood followed the significant outcomes of aquaculture. Poorly managed aquaculture can lead to a string of unintended impacts that place humans and wildlife in harm's way (WWF, 2015). FAO has determined that the environmental impacts of aquaculture are mainly associated with the high-input high-output intensive systems (FAO, 2005a). Meanwhile, the situation of the SSA fish farmers is not reassuring. It is worthy to consider that the governance of SSA fishery needs to be started as soon as possible before it is too late to save the environment and our aquaculture society.

### **1.1.3 Global distribution of fisheries workers**

It is estimated that more than 158 million people in the world depend directly on fish-related activities (fishing, fish farming, processing, trading) (HLPE, 2014). These fishers, both man and woman, contribute their time and labor in fishing harvesting, fish farming, fish processing, fish pre-processing and etc. Among them, more than 90 percent of global fishers are small-scale fishing operators living in developing countries (HLPE, 2014). The small-scale fishers are presented in many fisheries literature as the "poorest of the poor", asserts that they will never be competitive; they are too poor, vulnerable and marginalized. Eventually, as part of a "natural" modernization process, they will be replaced by large r-scale activities, which are able to engage in the global market (HLPE, 2014). Actually, there are a lot of poverty cases happening around the world. In harvesting, fishers's access to natural resources is reduced because of the competition with large scale or commercial fishing operations that own highly fishing efficiency. In aquaculture, the marketing competition ability of small-scale fishers is nowhere near that of the large -scale aquaculture.

#### **1.1.4 Organization and collective action and fisheries cooperatives**

Fisheries organizations and collective actions are implemented in SSF governance for solving the poverty and food safety and security problems. These organizations are normally organized by fishers, fish farmers and stakeholders and supported by government, non-government organizations and other authorities in the form of finance and other kinds of help for the common purpose of solving problems from fishers, fish farmers and stakeholders. The form of fisheries organizations differs from time and space. They were created by the age and contributed to reform the SSF so that the fishery was able to develop following the need of global changing. Customary organizations, cooperatives and societies, associations and unions, new 'supported' organizational forms and hybrid and networked arrangements are several forms of fisheries organizations running in the SSF governance until now.

Fisheries cooperatives remain active in the governance of SSF. They undertook many successes and failures and gained the experience of mixed reviews. The generally negative experience with cooperatives made certain that the 'revivalist endeavor' was a little more 'bottom-up' and made serious attempts to be genuinely participatory (J. Kurien, 2014).

Then, the 2008 Global Conference on Small-scale Fisheries recognized that "while for historical reasons the term 'cooperatives' can have a negative connotation, it is generally accepted that cooperatives could improve the resilience and stability of fishing communities" (FAO, 2009). It confirmed that contribution and functionality of fisheries cooperatives in the SSF governance. The conference also raised the functions of fisheries cooperatives : i) increase fishers' price-negotiating power with market intermediaries, help stabilize markets, improve post-harvest practices and facilities, provide marketing logistics and information, and facilitate investment in shared structures such as ice plants and fish processing facilities; ii) increase market competition by setting up auctioning systems; iii) use their greater negotiating power to make cost-saving bulk purchases of fishing gear, engines, equipment and fuel and to advocate with government; and iv) facilitate microcredit schemes for fishers, to reduce their dependency on intermediaries and give them greater freedom in selecting buyers (FAO, 2012a). These are the common contribution that fisheries

cooperatives did in SSF governance so as to help the fisheries communities had better life and hope.

However, fisheries cooperatives still need to improve themselves to avoid the problems caused by their weakness for the sustainable SSF governance. The international year of cooperatives thought the attentions of improvement of fisheries cooperatives should be paid on: a collective decision-making process towards a common goal; institutional response; enabling legislation; enabling legislation; financial resources; marketing issues; and linkages among factors (FAO, 2012a).

In a word, fisheries cooperatives are always an approach for SSF governance. They constantly learnt lessons from both successes and failures and continue to walk on the way to SSF governance, no matter what they will face.

### **1.1.5 The large st aquaculture country-China**

China is one of the biggest developing countries on the world with the large st population. Fisheries aquaculture created very excellent contribution to economic and social to China. Fish from capture fisheries and aquaculture as a proportion of total animal products (meat, egg, milk and fish) increased from 20 percent in 1985 to 32 percent in 2002(FAO, 2005). Beside the local consumption aquaculture fish products, aquaculture exports are the most dynamic force behind the rapid increase of Chinese seafood exports (FAO, 2005). The major aquaculture products exported were shrimp (frozen or breaded), baked eel, tilapia (gutted and frozen or filleted), yellow croaker (live or frozen whole), crab (live, frozen or cut), seaweeds or derived products, fish (live or iced) and shellfish (FAO, 2005).

While the scale of SSF in China is not the large st and the most serious on the world, the SSF still received attention from the community and appropriate pathways continues to be sought to prevent the fishers involving in the SSF from hard livelihood and even poverty while facing the natural resources collapse.

With the development of the science and technology on aquaculture, China has been the champion of the producing the large st aquaculture yield since 1990s. The aquaculture not only released the fishing pressure on the wild marine and

freshwater fish resource to help the resource recovery, but also provided developing opportunities to fishers.

China owns a very long history in aquaculture that could be dated back 2,400 years of fresh water aquaculture and 1700 - 2000 years of marine fish and shellfish farming (FAO, 2005). When it comes to fisheries cooperatives, China only can be seen as a kid compared with other experienced countries. Before the end of the Second World War and the civil war, fish culture in China has always been a family business based on experience accumulated over generations (FAO, 2005). These family businesses mainly engaged in small trades that enabled to afford their daily life and supply the nearby market due to limited output and transportation conditions.

Since 1950's, new culture methods characterized by the remarkable technological breakthrough (FAO, 2005) were implemented on fisheries aquaculture in order to develop the fisheries aquaculture industry. A variety of voluntary fisheries associations or fisheries cooperatives began to appear in fisheries aquaculture. But, less of them are able to be built and operate normally because the development of these fisheries cooperatives or associations in 1950's and 1960's deviated from the basic general principles of the cooperatives. Those cooperatives were built based on cooperatives theory of Marxist theory and the theory of Chinese transformation on peasant economy. Under such circumstance, all production means belonged to collective and the products were also purchased collectively. The producers worked without operational autonomy. Later, this kind of collective system under the central economy turned into family-run contract system that the producer would be responsible for their profit and loss, which is preferred by the producers, including fishers and fish farmers. They could get their marketing advice to select the most appropriate and profitable species they thought for breeding, processing and marketing. Relative to fishery cooperatives in central economy, family-run contract system provided more development freedom space.

Over many years, especially after 1990s when the reform and opening of China began, many problems from family-run contract system sprang up from the market mechanism, including the inability to cope with the fierce competition in the international market due to the weaker scattered individual operations, low

ability to withstand market risks, lack of adequate technical guidance to the fishers and inability to safeguard the interest of fishers. Facing the large demands from large market, it is time to gather these small family-run aquaculture in order to turning small to big. Fishery cooperatives across the country were slowly organized. However, many of them developed very slowly and even some lasted only few years because of many factors. Their insufficient self- management ability and crash from market and environment and killed many fisheries cooperatives and they faded out of people's sight. In recent years, fisheries cooperatives appeared on the governance stage in the new form trying to preform better after summing up their lessons from their own and others experience.

## **1.2 Research questions, methods and frameworks**

### **1.2.1 Questions**

In the long term of SSF governance, many organizational forms implementing collective action were applied and got the outcomes of both success and failure. Organizations and collective action in SSF have been recognized of their contribution to maximizing long-term community benefits and to dealing with the threats of fisheries mismanagement, livelihood insecurity and poverty (Kalikoski & Franz, 2014). Aquaculture fishery preformed its amazing productivity for global fish production. It also provided a large amount of employment opportunities for the entire society. But, at the same time of its rapid development, it also brought many problems that made us headache. Nowadays, the fisheries cooperatives approach is also applied on governance in SSF aquaculture fishery. Same governance approach implemented in different context will present different efficiency. Thus, in order to investigate the governability of fisheries cooperatives approach in governance of SSF aquaculture fishery, the research questions will be placed on:

- How do fisheries cooperatives impact the governance of SSF aquaculture fishery?
- What are the cons and pros of fisheries cooperatives in governance of SSF aquaculture fishery?



- How should the fisheries cooperatives do to be sustainable in aquaculture fishery?

### **1.2.2 Methods**

- Literature review

In the previous study, Papers, reviews, monographs relating to global fisheries cooperatives are collected and analyzed in order to provide a theoretical framework for this thesis. Reading those literatures to finding out the overview of fisheries cooperative approach in organizations and collective action as a governing mode in fishery. And build theoretical foundations for later SWOT analysis and governability analysis.

- Governability assessment of a case study

The governability assessment, or governability matrix, is used to present the governance of large yellow croaker aquaculture fishery in China and the further interaction among the different systems in the governance.

- SWOT analysis

Thought a SWOT analysis, a structured planning method is used to evaluate and understand the strengths, weaknesses, opportunities and threats involved in implementation of fisheries cooperative approach as a governing mode in small-scale aquaculture fishery in discussion.

### **1.2.3 Framework**

#### Chapter 1 Introduction

This chapter provided the background of global fisheries situation, the threat of resources collapse and the increased human consumption, the rise of aquaculture in recent years, the large st aquaculture country of China, problems caused by large number of SSF fishers, fish farmers and stakeholders, the organizations and collective action used to solve their problems as well as the research questions, methods and framework of this thesis.

#### Chapter 2

This chapter provided overview of the global fishery and organizations and collective action in SSF governance. The specifications of fishery, fisheries

workers and the conception of organizations and collective action along with fisheries cooperatives will also be presented.

### Chapter 3

This chapter provided the theory of governance and governability and the importance of governing interactions in the SSF governance.

### Chapter 4

This chapter provided a governability assessment of fisheries cooperative approach implemented in governance of large yellow croaker fishery in Ningde City, China will be taken to point the development of fisheries cooperatives and their measurements and the outcomes. The relations and interactions in the governance will be elaborated as well.

### Chapter 5 Discussion

This chapter provided a SWOT analysis of strength, weakness, opportunity and threats of fisheries cooperative approach in governance of SSF aquaculture fishery to discuss the results of research questions in this thesis.

### Chapter 6 Conclusion

This chapter provided the conclusion of the research. It sum up the present utilization of fisheries cooperatives in governance of SSF, the new discovery and prospects of fisheries cooperatives.

## **Chapter 2 Organizations and collective action in fisheries**

### **2.1 Specification of global fishery**

Fishery is an industry that has limitations during the production processes and restrictions from both environmental pressure and global markets. Both fish harvesting and aquaculture belong to a rather weak industry due to the high natural risk and seasonal production. The perishability of fisheries products causes the high requirement of storage and transport in circulation in the entire fisheries system.

Besides, the fishery operates in a specific aquatic environment that is different from the terrestrial one. It provides deeper stereoscopic space under the water that can be divided into surface, deep and bottom layers. Harvesting in various water depths requires multiple fishing gears and tools, including pelagic and deep-water trawler, Danish seine, gillnet and long-line fishing. Effective aquaculture methods such as high-density culturing and multiple-species culturing for increasing production efficiency are used in fisheries aquaculture depending on the present water context. In addition, the utilization of water space is also complex such as that harvesting right, aquaculture right and other rights to use the water space are gradually defined for different purposes so that it is not easy to solve the problems as the result of the changing of water space utilization.

The fishery is restricted by its biological nature. Some fish species are migratory. They will gather together for spawning, feeding and wintering following migration routes in different seasons and growth stages. It is best to take the knowledge about their migration for effective harvesting. Secondly, quality of fresh fish products are requested by the market, but they are difficult to be stored due to perishability that limit the development of fisheries industry in some countries, especially the island countries that are short of transport condition.

The fishery is a high-cost industry with high productivity, especially in large-scale fishery. Cost of fish vessel, fish gears and tools and fuel for harvesting and persistent cost of fishing gears and tools, fishmeal and fish medicines for aquaculture are higher than the terrestrial farming. Meanwhile, the price of fish

products is relatively higher than other food so that fishery has a quite high input-output ratio. But in SSF, it is usually associated with poverty. Many SSF fishers fish only for food and have no other jobs so that it is difficult for them to get income if they just focus on fishing in every day.

The fishery is an unstable industry with high risk. In terms of harvesting, fisheries resources sometimes collapse is the most happened situation that brings constant pressure on fisheries production and fishers' life if the fisheries resources are not given to recover. On the other side of fisheries aquaculture, large scale culturing activities in lakes and coastal area face instability from natural environment and unsuitable operations due to lack of suitable management. Moreover, natural disasters that will threat fishers' life and bring their family to ruin make the fishers and fish farmers worry about fisheries productions and livelihood.

Fisheries are a global industry. It is inevitable that fisheries production take place at any place as long as there exists aquatic area, even small artificial ponds and other culturing equipment can give chance for operating fish culturing to terrestrial countries and regions. The focus on the fishery has been increased by recent years. People whoever live in developing or developed countries start paying attention to the global fisheries issues such as poverty problem, food safety and security about fishery and the situation of wild fish resources. Further more, fishery is being increased its productivity to provide more food and working opportunities to humans for resolution of some problems, especially fisheries aquaculture.

Global fisheries can be divided into large -scale fishery and small-scale (artisanal) fishery. The former one usually is taken place in the offshore with large vessels having huge capacity and strong power and less crew onboard. The cost of large -scale fishery is quiet high because of the large and expensive vessels with strong engine, large frozen storage and wide and big fishing gear and nets. The changing fuel price is the external factor that causes its cost instable. The latter one is related to a large population and many intractable problems. As mention above, 90 percent of 158 million fish workers, including fishers, fish farmers and stakeholders in fisheries process and their family members who are part-time, work in SSF. Here, they are collectively referred to fisheries workers. A part of

fisheries workers has link to the poverty and food security problems that are highlighted by FAO.

## **2.2 Specification of fisheries workers in SSF**

Fisheries workers are often weak and marginalized. Some fisher or fish farmer is a tough job that people who take it need suffer hard and lonely for a long time. Many people take fishing and fish farming as their career only for the purpose of earning a living instead of being interested in it. In some contexts, people only fish when they do not have food. Besides, no matter harvesting or culturing, especially those taking place on the sea, will take a long time to stay away from the mainstream society which make them difficult to integrate into it when they go back to land after finishing work. Less attention is paid on these people while TV and newspaper media rarely broadcast relative information to the public so that the public do not know and understand what actually is happening in that world and the fisheries workers are marginalized by the mainstream society. Even in some developing countries, they were often considered to be careless spendthrifts; loud-mouthed; drunkards; easily provoked to anger; 'smelling of fish' and so forth (J. Kurien, 2014). It is unfair because a lot of them are hard working workers who do the same thing as a common worker in any career to support them and their family.

Fisheries workers easily lose their basic living resources. If land is the resource for farmers, the aquatic space is fisheries workers' treasury. Their living security will disappear when their right to have access to the aquatic area where they used to harvesting or culturing fish for food is taken away. The fisheries resources collapse also bring more pressure to them while it is difficult for the participators to solve such conflicts by themselves individually. Violence is definitely not the way out of them.

The age range on fish workers is wide. In some places, children and elders participate in the fisheries operations. It increases the risk of fisheries production and violates the requirement for production security. Fisheries production within great working intensity needs a high demand of strong body,

quick response and a well-established training. The qualified crews and fish farmers should be the best to work onboard rather than children and elders. High cost of input brings fish workers more pressure. Fishing gears and nets and small or middle fishing vessels are expensive, but necessary facilities for fisheries production. These facilities still need to be renewed by the change of related fishing regulations or because they are old and broken after being used for many years. It is a heavy burden for small-scale fisheries members, especially those who only fishing for livelihood instead of money. The possibility of losing livelihood resources is largely increased in such context. In addition, the fish processors who work on land also need fridges to store fish products that are their treasures.

Fish workers experience more natural disasters that mostly mean danger and losses of property. Both fishers and fish farmers working on the sea will directly take the challenge from seasonal typhoon and other kinds of natural disasters that always lock them in the harbors for their life safety. In marine aquacultures, fish farmers will be transformed to land but not their culturing facilities. What they can do to protect their property is to reinforce them as much as possible and pray. Sometimes, the typhoon makes fish farmers losing everything on the sea as a result of blow away the culturing facilities.

### **2.3 Strengthen organizations and collective action in SSF**

Many small-scale fishers worldwide suffer from low incomes, lack of adequate access to markets, social and political marginalization, exclusion and discrimination, and low levels of health and education, including both male and female (J. Kurien, 2014). According to the reviews of SSF, it is clear that some fishers can solve these problems by themselves, but there remains a majority of them living in misery as a result of fisheries problems.

So, the United Nations pointed out that organizations and collective action should be strengthened in SSF.

“Working together in consort, to achieve common ends, is a fundamental human trait (J. Kurien, 2014).” So far, with the development of human civilization, this type of solution method is used to settle a large number of problems when

individuals' ability is not sufficient to handle them. The experience also told that two hands are better than one.

As the saying goes, United we stand, divided we fall. Power and wisdom of individuals are always weaker than those in a group. In the realm of SSF, collective action and organizations are used to ensure sustainable fisheries for long years. Collective action is referred to actions taken by a group of individuals for common interests (J. Kurien, 2014). It has the feature that it can happen spontaneously, informally, temporarily and sustainably. The motivation to collective action depends on whether the common interests can be achieved or not by implementing the collective action. It is possible that one collective action will be stopped when the common interests are completed or replaced by other collective actions if it has no or less positive effect on the common interests. The individuals taking the collective action are the decision-makers and the beneficiaries. They form various types of organizations. It is necessary to know that collective action can occur without organizations, but any organization is same as an empty shell if without collective action (J. Kurien, 2014).

#### **2.4 Elements in organizations and collective action**

Any fisheries organization has its own structure, but some elements are required. They are the backbone in the organization's structure and negative effects will take place on the stability of organizations and feasibility of collective action if any of the elements is missing or broken.

- Fairness and voluntary

Fisheries organizations are the groups made of fishers, fish farmers and related fish processors. Initial members should agree collectively and resolve to stand by the basic purpose/objective for which the organization has been created (J. Kurien, 2014,p67). All of them have the right to voluntarily join in the relating fisheries organizations to participate the decision-making of objectives and strategies of collective action. None of them is supposed to be rejected because of any reason referring to gender and other kinds of discrimination. Male fishers and fish farmers undertake major harvesting and culturing production, however, female fish processors who perhaps are family members of males or not also rely

their life on processing fish product on land. On the other hands, those females who are males' family members but not work in fisheries production also has right to the one of member in fisheries organizations. It should be recognized that females' activities at home and on land is important for males to stay on the sea.

- Democracy management

Fisheries workers and their families who form the initial membership of a fisheries organization establish fisheries organizations. These people create the initial objectives, and of course, all of them collectively agree with these objectives and stand by them. And the later members are supposed to agree with them as well until they are achieved or changed over time.

After the objectives, the fisheries organization needs a vision for collective action. It does not matter whether all objectives will be achieved, but desirable vision can help the members increasing their morale. As the Japanese saying goes, vision without action is a daydream and action without vision is a nightmare. (J. Kurien, 2014,p67) Certainly, the most the important thing in this stage is that all the members should attend to articulate the vision statement as well as agree with it collectively.

With fisheries organizations' functioning, strategies for collective action are going to come into use. Of course, the ability of members in the fisheries organizations may not be adequate to complete it so that some internal and external supports are used for effective strategies. The power of human engines and enthusiasm and spirit of voluntarism from membership of fisheries organizations is the internal support while they can draw the external support of expertise from other created organizations or government. Implementation of any action needs financial fund. In fisheries organizations, it can be collected in the organization but also can be fund by the external such as state and non-government organizations.

During the processes of functioning of fisheries organizations and implementation of collective action, the causes and outcomes of different methods for achieving the common objectives should be recorded and regarded as valuable information for summary of past and inspiration for future, no matter they are success or failure.



Possessing resources is no guarantee for smooth and meaningful functioning of the organization sequence (J. Kurien, 2014,p69). Many failures are the result of misusing their resources. Meanwhile, different objectives should be achieved by appropriate measurements. Key to success is the judicious use of resources in the right measure and sequence (J. Kurien, 2014,p69).

Last but not least, Laws and norms (both within the organization and externally) that are required to facilitate actions intended to achieve the objectives must be put in place (J. Kurien, 2014,p69). How could the collective action is implemented under the circumstances that it is out of the legal protection. It is likely that they members did something they thought were good to their production but not comply with the provisions or laws so that their effort would become nothing.

- Respect and confidence

Respect and confidence are the glue that link and combine all the members in fisheries organization to implement the strategies of collective action. Especially between leaders and members, mistrust and discord, as the results of contradiction will have a bad effect on the functioning and development of fisheries organization.

- Vision for development

Evaluation and alliance are the suitable way for the fisheries organizations to enhance their capacity and scale.

Collective action should be evaluated for the future. Many organizations function at the same time worldwide. Lessons learning from other organizations' success and failure are as important as those in own. Especially when facing the difficulties that cannot be solved themselves, referring to others' solutions not only may help directly, but also bring inspiration to improve the collective action for preventing the fisheries organization from the similar problems. When the fisheries organization is functioned in a successful result and large r scale is required for further development, except admit more members, alliance with other organizations that have the same interests and vision. It can increase the scale if member while expand the scale of fishing area so as to expand the scale of the fisheries production.

Consequently, fisheries organizations are organized and governed by their members. The conception in the fisheries organization is their members who gather together solve their common problems or meet their common demands by governing themselves with coherence of their pygmy effort and collective action. Once their members lose the ability or right to participate in the decision-making and govern their organization, it will never be an organization unless they become the owner again.

According to the history of collective action, several types of organizations are documented, for examples, customary organizations, cooperatives and societies, associations and unions, new 'supported' organizational forms and hybrid and network arrangements. They have been utilized in the SSF worldwide for many years with success and failure, and even some are still working in somewhere so far.

## **2.5 Fisheries cooperatives**

Cooperatives mode is one of the fisheries organizations. It is created by Robert Owen in 1817 and weaved by Rochdal in 1844 that believed that being voluntary, democratic and self-controlled, the cooperative provided the framework by which grass-root communities, through group effort (collective action), could gain control over productive activities from which they derived their sustenance and livelihood. Implicit in this belief was the rationale that cooperative development would originate from people's own interest and motivations (J. Kurien, 2014, p48). However, the development of cooperatives in the next 150 years did not go well. In 1950s to 1970s, it even became a tool of government to preform their outcomes on the development of fishery in some developing countries.

So far, cooperatives are defined by the International cooperative alliance (ICA) that can be the representative of cooperatives as:

An autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations, through a jointly owned and democratically controlled enterprise (J. Kurien, 2014, p49).

ICA listed seven principles for cooperatives:

- Voluntary and open membership
- Democratic member control
- Member economic participation
- Autonomy and independence
- Education, training and information
- Cooperation among cooperatives
- Concern for community

The seven principles represent the identity, democratic functioning mode, the way to expansion and corporate responsibility of cooperatives.

The fisheries cooperatives should be an organization of fishers, fish farmers and stakeholders concerning their livelihood, job and welfare. They should be started as a consequence of spontaneous action by fishers in response to exploitation by merchants; or to situations where their traditional rights, or access to fishery resources, were threatened by outsiders (J. Kurien, 2014, p52). Every thing in fisheries cooperatives is created, found, solved, developed and concluded by and for their members. The common requirements form members are the final and only goals.

Compared to other fisheries organizations, fisheries cooperatives are permitted to take business in some countries (J. Kurien, 2014, p52). If the fisheries cooperative goes very well, it means that it is likely to less rely on the support and even can invest itself through its membership. Members not only participate in the decision-making, but also play a role as investors in their career. They spend more efforts on their job due to their beautiful expectations along with the increased responsibility.

In view of the bad experience of fisheries cooperatives, their reputation is worse that the decayed fish for fishers and fish farmers in some places. But there remained many success cases globally of fisheries cooperatives approach in governance of SSF. These cooperatives exhibited success in a variety of realms, including inter alia, their efforts to provide inexpensive credit; to mobilize savings; to deliver inputs for fishing at cheaper prices; to organize livelihood provisions for fishing families; to process and market the fish of their members and also safeguard the original rights (J. Kurien, 2014, p52). It means that the

fisheries cooperatives approach in SSF is not a failure and its implementation need to be improved from the lessons learning from those successes and failures. For instance, though the experience with cooperatives in the fisheries sector and for small-scale fishers often spanned over two to three decades, it was difficult, in most developing countries, to claim that they made a real change in the quantitative or qualitative aspects of life and livelihood of fishers (J. Kurien, 2014, p52). How to run sustainable fisheries cooperatives in SSF governance to achieve the goals both in the quantitative and qualitative aspects is the research that needs to be searched.

## Chapter 3 Governance and governability

### 3.1 Theory and components

Maarten *et al.* (2013) indicated that governance is the aggregate of governing activities carried out by societal actors in response to public needs and visions. It is generally organized and routine, rarely harmonious but typically interactive. In fisheries governance, the societal actors have much different impossibility. Sometimes they are the national or local government or authorities responsible for fisheries industries. Sometimes the Non-government organizations can also qualified for this role. They govern also various fisheries activities, for examples, fishing harvesting for commercial or artisanal purposes, fisheries aquaculture in large or small scale and also fish processing and marketing and so on. These activities constitute some major parts in fishery industry or they consist of a whole fishery industry. The people who operate those activities are fishers, fish farmers or fish processors working for the basis life of themselves and their families. However, these activities are not all plain sailing. Internal or external factors as fish resource collapsing, climate changing or market changing will cause the fluctuations in operators' life, for instance, lack of food and income. They are not able to solve these problems so that they need the societal actors' help. For the societal actors, helping the fisheries operators to solve the problems taking place in fishery industry also help themselves to finish their job as a governor and win the fisheries stakeholder's confidence and support. The interactive governance is defined as: The whole of interaction taken to solve societal problems and to create societal opportunities, including the formulation and application of principles guiding those interactions and care for institutions that enable them (Maarten *et al.*, 2013). It totally corresponds to the conception of the governance and can be regard as one perspective of all governance perspectives. According to the conception on interactive governance, the interactions taken in fishery are the most important movements in fisheries governance. Knowing about these interactions in fishery will conducive to find the correct solution to the problems appearing in fishery and develop new opportunities to fishery.

Governability is defined as “the overall capacity for governance of any societal entity or system” (Maarten *et al.*, 2013). Various governing approach taken by different societal actors will show effects to higher or lower degree on the system-to-be –governed so as to demonstrate their ability on governance. The definition of governability is built on the notion that societies, or parts thereof termed societal systems, are made up of three related components: a system-to-be governed, a governing system and governing interactions (Maarten *et al.*, 2013), which is shown as Figure 1. In fishery, both natural system with environmental and biological aspects and social system with human society consist of the system-to-be-governed. In each system, four properties that are diversity, complexity, dynamic and scale present their content by the variables that are components, relationships, interactions and boundaries. The interactions are taking place in and between all systems.

### 3.2 Importance of governing interaction

Interactive governance theory suggests that the central features of system-to-be-governed and governing system are normally reflected in governing interactions (Maarten *et al.*, 2013), which is shown in Figure 3.

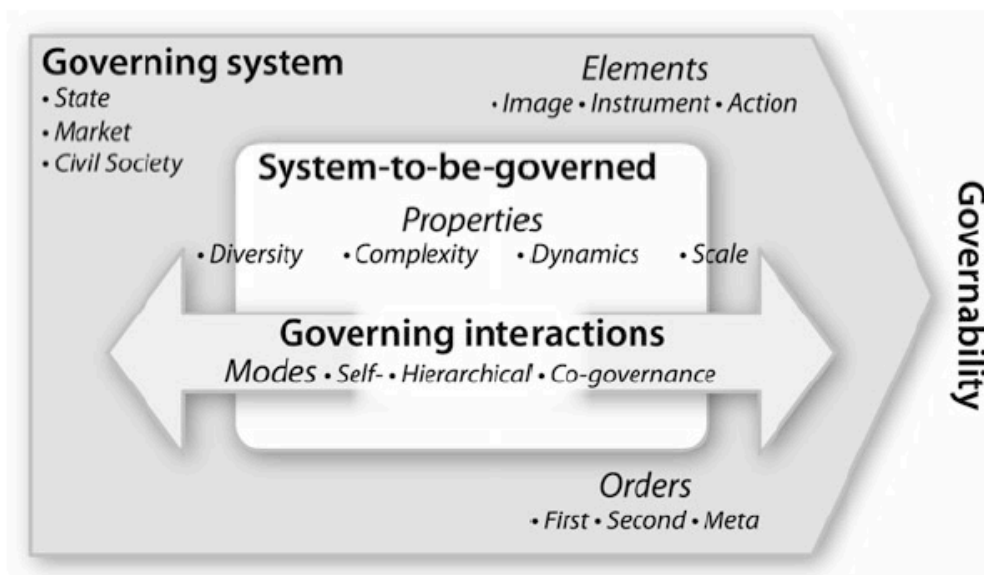


Figure 3 Interactive governance perspective of a societal system (Maarten *et al.*, 2013).

Participations of both system-to-be-governed and governing system are very important in governance. In fisheries interactive governance, all entities including fishers, fish farmers and processors and fish merchants should care the

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process of governance and contribute every idea they have to participate in fisheries interactive governance. It is a manner in preventing themselves from being controlled as well as their existence and importance for fisheries industry. There are three modes of governing interactions: self-governing mode, hierarchical mode and co-governing mode (Maarten *et al*, 2013). To assess the capacity of governance, a governability matrix including properties of diversity, complexity, dynamics and scales of related system components that are natural and social system-to-be governed, governing system and their governing interaction will be addressed, which is shown as table 1.

**Table 1 matrix of governability assessment**

	System-to-be-governed (Natural and Social)	Governing system	Governing interactions
Diversity	Who are under control of governing system and in the system-to-be-governed?	Who play the roles of governing system?	What are the interactions between governing system and various systems-to-be-governed?
Complexity	What are the relationships in and between different entities?	What are their relationships?	How does the interactions take place?
Dynamics	What are the interactions in and between different entities?	What interactions they have?	What changes have in the interactions?
Scale	What is boundary of the system-to-be-governed?	What is the boundary of their governing activities?	Which boundary does the interactions cover?

This matrix is helpful to discuss and well understand the features in and between all the related system components for assessing the governability in the governance.

## **Chapter 4    Governability assessment of a case study of large yellow croaker aquaculture fishery in Ningde City, China**

### **4.1    Background of LYC aquaculture fishery**

The large yellow croaker species is the main product resource of the aquaculture large yellow croaker fishery in Ningde City of Fujian Province, China.

The yellow croaker, whose synonyms is *Pseudosciaena Crocea*, started to be cultured since 2003. The live or frozen whole products of yellow croaker are sold to South Korea as one of the major exports in Chinese aquaculture industry (FAO, 2005-2015). The top recorded capture yield of *Pseudosciaena Crocea* was 237349 tons in 1974 and the recent outputs were less than one-thirds of the top yield due to the strategy of marine resources recovery. Compared with that, the yield of aquaculture *Pseudosciaena Crocea* continued to increased and reached to 95118 tons in 2012 that has exceeded the yield of capture (Richardson, 1846).

#### **4.1.1    Natural advantage**

Ningde City- motherland of large yellow croaker

The wild large yellow croaker species distribute in the northwest Pacific Ocean along the coastal line of Yellow and East Sea of China, west of North and South Korea and the west of Japan. They live in the shallow water as a season migratory species that inhabits the coastal water and estuaries. They have two spawning seasons, spring and autumn, in which they swim from the shallow seawater close to the river estuaries to do their reproduction. The Large yellow croaker species clusters together when they stay in the wild seawater. Small fishes and crustaceans are their daily food.

Guanjing Ocean locating at the Ningde city is the spawning protected area of Yellow Croaker species. Many small islands and deep-water bays are the natural habitat for the wild Large yellow croaker, not mention that it is also the last and unique inner-bay spawning ground of Large yellow croaker in China. The quality of seawater is suitable for culturing large yellow croaker with the surface temperature of 10 to 30 °. The islands consist of a prefect safe haven to prevent all the offshore operations from deadly destroying by the seasonal typhoon.



Nothing will be better than raising a child in their families that is same as aquaculture. It is the best choice to develop the large yellow croaker aquaculture fishery in Ningde city since it is the motherland of this species.

Furthermore, Ningde City is also the place where the large yellow croaker aquaculture technique was born. Liu Jiafu, who is regarded as the father of large yellow croaker, has devoted himself to research for improving the technique of culturing large yellow croaker since 1985 and still works on it.

Since 1999, large yellow croaker aquaculture has formed in a large scale. The annual yield in China is increased from 5.9 thousand tons to 71.7 thousand tons and the annual yield in Ningde City kept 84% to 94% of that countrywide. Ningde City is worth of the motherland of large yellow croaker aquaculture.

#### **4.1.2 Culturing equipment and scale**

So far, both ponds and deep-water cages are the aquaculture methods of large yellow croaker aquaculture. But, the latter one is applied in Ningde because of its inherent environmental advantages. Those traditional cages are made by wood or bamboo with the size of 4-4 m and 4-6 m depth along with net mesh size of 4 cm. the number of cages of each fish farmers ranges from a dozen to more than one hundred depending on the situation of financial ability of each fish farmer. Cages belonging to each fish farmer are usually linked together to form a small fish farm on the sea. These linked cages illustrated scenery of community on the sea that is presented in Figure 3.



**Figure 4 View of LYC aquaculture fishery in Ningde City, China (NDFA, 2015)**

The fishmeal fed to Large yellow croaker is made by frozen small fish and artificial processed fishmeal. It is impossible to feed the fish by 100% artificial

processed food until now, but the research teams never stop working on its possibility.

The fries of Large yellow croaker are normally cultured in February each year. The fish farmers can buy them that are around 3 cm from July and start culturing them in the cages locating on the sea. The fish will grow up to approximately 500g in two years and be harvested and sold. However, the larger the fish is, the more valuable it will be.

#### **4.1.3 Fish farmers and stakeholders**

The whole process of Large yellow croaker aquaculture refers to fish fry, fish aquaculture and fish sale. In these three sessions, the merchants will supply the fish fry, fishmeal and fish pill while fish companies and middlemen take the sale session.

The people who witness the most significant growth of fish are fish farmers whose daily work and decisions of ways to culture large yellow croaker decide the quality of fish products. The large yellow croaker fish farmers come from different social groups: fish farmers who culture other species before Large yellow croaker, fishers who transform to be Large yellow croaker fish farmers due to their vessels' decommission and the other people who engage into Large yellow croaker aquaculture as the new beginning in their career and life.

Although the traditional fish farmers have richer experience of culturing other aquatic species and certain skills of operating aquaculture fishing gears and tools than the other two groups, all of them are freshmen in the Large yellow croaker aquaculture fishery in terms of a new aquaculture technology exploited in 1985. They gained some training courses on how to culture fish, use fish pills and export the relating products, especially the fishers (Notice). In a word, they are the members in small-scale large yellow croaker aquaculture fishery if they operate such aquaculture in Ningde.

These fish farmers work and live along with their fish cages and fish on the sea. They built their houses with basic and simple living equipment such as gas, fresh water, power, and even Internet and cable TV. So far, the architectures appearing on the sea not only are living houses, but also community management institutions, police stations, supermarkets, restaurants and

entertainments. Even so, the life on the sea still is filling with bad smell from fish meal and loneliness. Many fish farmers expressed that the most difficult thing is not how hard their work and life are, and that they are missing to their family who lives on land or other cities.

The fish farmers mentioned above and other fisheries stakeholders organized fisheries cooperatives existing in the large yellow croaker aquaculture fishery voluntarily. According to the principles of organizations and collective action, fish farmers cannot be forced to become a member of any fisheries cooperatives. Their voluntary nature plays an important role in the implement of collective action for fish farmers' common objectives.

Before the establishment of fisheries cooperatives, fish farmers are individuals that are called family-run SSF. Normally, a boss will be the crew at the same time. They rarely hire any crew, but their family members will work with them sometimes. Under such circumstances, the ability of collecting information, making business and handling threats is weak because they fight alone. Competition among other fish farmers are also very fierce, which make them made incorrect production selections such as using banned fish pill or ultra-density culturing.

#### **4.1.4 Governors and their responsibility**

Ningde Ocean and Fisheries Bureau and its functions

Ningde Ocean and Fisheries Bureau (NOFB) is the municipal ocean and fisheries government who takes the responsibility to all fisheries activities and utilizations of sea under its jurisdictions area.

There are many departments belonging to NOFB, including Ningde City of Ocean and Fishery Law Enforcement Detachment, Marine ecosystems of specially protected areas and Guanjingyang Ningde large yellow croaker proliferation station, Fujian Fisheries Research Institute, Ningde City of Ocean and Fishery Environmental Monitoring Station, Ningde City Fisheries Technology Extension Station, Ningde sea use dynamic monitoring center, Ningde City Aquatic Supply Company, Mindong large yellow croaker Corporation, and Ningde City Fisheries Association (NDFA, Ningde large yellow croaker Association).

All the departments perform their own functions following the strategies and policies of NOFB to achieve the overall goals. The main duties of NOFB are listed as follows:

- Development strategy and relevant policy and measurements

Ningde Ocean and Fisheries Bureau protocols and implements the ocean and fisheries development strategies and relevant policies and measurements in the juristic area of it. The strategies, policies and measurements must follow the National and provincial marine and fishery laws, regulations and policies to suit the overall development in China and the demands of related people.

- Development of Ocean function zoning, the sea and island, marine and fisheries regulations

NOFB is supposed to make the plan for the development of ocean function zoning, utilization of sea and island and marine and fisheries regulations and monitor their implementation. According to these plans, coordination should be taken by the NOFB to keep the balance among various governmental departments and industry.

- Paid utilization of sea

In China, the paid utilization of sea is applied to marine industry. The NOFB should take the responsibility of maintaining the order monitoring of utilization of sea and implementing the system of paid utilization of sea, including seawater ownership registration, demonstration, evaluation and boundary demarcation of sea water and submarine construction.

- Ocean environment and conservation of fisheries ecosystem

All environment and conservation of fisheries ecosystem is under the jurisdiction of NOGB. The plan of marine environment conservation and governance is protocoled by NOFB and relevant departments to make a format for the purpose of maintaining the exploration of multiple marine activities. For stance, offshore oil exploration and development, coastal and marine projects, and marine dumping debris are not allowed to damage the marine environment. Meanwhile, NOFB also need to monitor the marine biodiversity in its jurisdiction area.

- Disaster prevention and fisheries production order

NOFB organizes the investigations, supervisory, surveillance and evaluation of marine environment and report the marine hazard warning to all fishers and fish farmers who work on the sea to protect them from losing life and property.

When the disaster passed, NOFB also need to take an impact assessment to strengthen infrastructure of disaster prevention and mitigation.

NOFB should organize the fishers and fish farmers to apply safe fisheries production to ensure their basic living requirement.

- Fisheries management

NOFB implements the fisheries licensing system to control the access to fisheries in order to maintain the order of fisheries production and protect the marine ecosystem. According to fishers and fish farmers' demands, NOFB is supposed to make a plan about the fisheries technique development to improve the development of fisheries. Otherwise, it should help fishers and fish farmers to start foreign economic relations and communication of fisheries techniques.

- Statistic management

Data including economy, finance and other information collected from all fisheries and other kinds of marine activities are recorded by NOFB for the further suggestion to marine development of Ningde City.

It is special that the Ningde City Fisheries Association editor the "Fujian large yellow croaker breeding advantage of regional development planning" twice empowered by the Fujian Provincial Ocean and Fisheries Department.

#### **4.2 Export crash in 2007 and its impacts**

Before 2006, development of large yellow croaker aquaculture industry conducted very successfully. It only takes less than 29 years to develop this industry from the breakout of aquaculture technique to export to abroad. The happiness and honor as results of successes of expansion of aquaculture and economic benefits caught fish farmers, stakeholders and governors' eye so that some potential threats were neglected. They did not return to people's attention until 2006.

South Korea is always the regular customer of large yellow croaker. Around 10000 tons large yellow croaker fish was exported to South Korea every year in 2003 to 2005. However, the frozen large yellow croaker products were detected

the excessive levels of chloramphenicol in South Korea that caused the stop of export of large yellow croaker products in the late 2007. Almost every large yellow croaker product exported to South Korea was detected. Those products that were not qualified were not allowed to be export into South Korea. Many contracts were canceled and the business was stopped. It made many export companies and their fish farmers lose a lot of money and made them sad and disappointed. Later, South Korea increased the requirement of non-tariff barriers to trade that made the hurt large yellow croaker aquaculture worse. The export yield in Ningde City every year was decreased to just 5000 tons until 2009.

#### **4.2.1 Main factors causing the crash**

Large losses of finance and unyielding spirit turned the attention from fish farmers, fisheries stakeholders and governors back to the large yellow croaker aquaculture production in order to find the factors of products failure. They found that the main factors are negligent management and non-standard production.

In terms the former one, the NOFB has recognized its negligence on not governing the entire industry in time and discussed the solutions on the present bottle neck of the development of exported large yellow croaker industry with fish farmers, stakeholders and experts. And they actually played a competent role in the next process of governance on large yellow croaker fishery.

They increased their ability and numbers of monitoring, controlling and surveillance (MCS) in later time. But there were also problems making the governance difficult that the number of fish farmers involving in the large yellow croaker aquaculture is too large to governing their production one by one. For instance, there were several thousands fisher farmers culturing in Ningde City and each of them had averagely 100 cages. It would be a large program to monitor and test the fish quality, production process and water quality in each cage of all fish farmers in terms that NOFB is just a local authority. Then, different fish farmers sold their fish to different companies for different purposes. For example, some supply the export fish company and some only sold

the fish to the local market. Hence, there were different standards for each purpose and definitely that for export products was much higher than that in the local market. It made the governance in trouble that governing the entire industry on the high standards would make the fish farmers who have no relation to exports disgusted to accept such evaluation.

When it comes to the non-standard production, excessive culturing density and excessive and inappropriate use of fish medicine were the main factor.

As mention before, the square meters of the cage is normally 16 square meters. Sometimes, over 6 times fish fry would be pulled in and be cultured. It can be imagined that the living and acting space to large yellow croaker would become smaller and smaller with their growth on weight and length. Lack of space not only made fish missing activity that cause fish being fat, but also increased the possibility of fish infectious diseases in each cage. It would be worse that fish in other close cages was infected because the culturing water cannot be refreshed in time as a result of high density culturing in all linked cages. Finally, fish in many cages would die in a short time that caused huge losses of fish farmers. Certainly, fish farmers are not fools. They selected to use fish medicine to control the fish diseases. However, they are not clever enough to control the amount of how much fish medicine they should put in each cage. Hence, usually they put excessive fish medicine in the water to ensure its efficiency. fish diseases decreased but their cost was increased due to using large amount of fish medicine. Some fish farmers who did not want to pay too much for fish medicine have to choose the cheaper one from some special way such as black market. No one can ensure the sources and efficacy of those medicines so that a greater hazard was buried in the large yellow croaker fishery. Finally, the large use of fish medicine did not completely eliminate the occurrence of fish diseases, but residues of fish medicine in fish caused fish quality degradation that made the export of large yellow croaker faced the biggest challenge.

Last but not least, all the non-standard productions made the quality of culturing water to fall. One day there would have no possibility to culture large yellow croaker when the sea water quality is totally destroyed, even Ningde used to be the haven of large yellow croaker with the advantage of natural environment.

Otherwise, fishmeal and environmental pressure from the land were the smaller factors. The technology of synthetic fishmeal was not good enough to 100% used in the culturing fishery. It still needs more time and money to exploit it.

Coordination with other departments on land such Ningde City Environmental Protection Bureau would be required to release the pressure of culturing water.

### **4.3 Implementation of fisheries cooperatives approach in governance of LYC aquaculture fishery**

After the discussion with fish farmers and stakeholders, NOFB decided to apply the approach of cooperatives that is called governance mode of grouped fish raft in marine culturing. Under this governance mode, 13 fish process companies and 1230 fish farmers formed a fisheries cooperative on the purpose of large yellow croaker export aquaculture fishery in 2008. Three fish process companies have joined in this fisheries cooperative in the next six years. All fish farmers were divided into 3 regions (Jiaocheng, Xiaopu and Fuding) depending on their geographic location and 21 groups according to the number of fish cages (Ningde China). This fisheries cooperative has 4 components: committee of export process management, committee of fish raft, committee of supervision and coordination and administrative office. Each committee had its own function to different sections in the large yellow croaker aquaculture fishery. The officials working in these committees came from the fish process companies, fish farmers and stakeholders. Their main tasks are coordinating the contradictions in the fisheries cooperative, promoting the importance of standard production and provide the help to members. At the same time, they also needed to coordinate with the NOFC and its belonging department as well as to carry out the regular and random examinations of fish and seawater.

#### **4.3.1 Goals**

After the experience of the failure in South Korean market, the situation of export market of cultured large yellow croaker went into a depressed state. The fisheries cooperative for reinvigoration of this industry settled goals as follows:



- Following the establishment of the fisheries cooperative, goals are settled out in terms of the present situation and the related factors that causing the failure to the export market.

Increasing the quality of fish products to satisfy the international requirements of export fish products

Facing to the failure on the export market, rejected quality is the first problem that must be solved for recovery of the large yellow croaker export market. It does not matter which country is the import country. Only when the quality of all fish products is improved to a level at which can be equal to or even higher than that they require, the door for export large yellow croaker products will open to the entire industry again. If not so, large yellow croaker has to stay home forever.

- Standardizing the entire large yellow croaker aquaculture production including fish fry source, culturing production, use of fish medicine, selling and export process at collective level

The culturing production was non-standard, and that caused the bad quality of fish and polluted the culturing water. The quality of culturing water for fish can be regarded as important as air to humans. It directly impacts the quality of fish., Standardizing the culturing production not only can help to solve the present problems of non-standard culturing, but also provide convenience for governors to readjust the industry macroscopically and for fish farmers and stakeholders to evaluate culturing system with the development of technology.

- Lowering the culturing production risk in the fisheries cooperative and stabling the production safety.

As the result of non-standard production, a large amount of fish died in cages due to fish diseases that caused large losses to fish farmers frequently. Especially after the typhoon season around October to November, the hot weather and warm water temperatures increased the possibility of the occurrence of fish diseases. It is often the best time to harvest large yellow croaker after typhoon season. The sudden disaster hit the fish farmers by surprise. There was only a small step to the success. It indicated that the large yellow croaker aquaculture industry became a business with high risk of losing everything according to such context. So, the production stability has to be increased in order to enable the fish farmers to have easy production and life without fear and trepidation.

### 4.3.2 Measurements

All measurements can be divided into two steps implemented on the governance of large yellow croaker aquaculture fishery.

The first step included 8 collective actions that were implemented as measures to standardize the production process, fish products process and export sales for purpose of recovery of the export large yellow croaker aquaculture fishery:

- Collective pharmacy of fish medicine

One pharmacy with six clinic points would be placed in each culturing region so that a system of a supply center and selling points for fish medicine was appeared in each region. All used fish medicine is under someone's responsibility of procurement, detecting, inspection, storage, delivery and tracking of their usage. It is a chain-style service for the fish farmers that ensure safe source of fish medicine and monitor of used amount of fish medicine.

In each pharmacy and clinic point, there was a fish doctor worked for all members in cooperative. They mainly responded to collect and master the data about the dynamic of fish diseases in their regions, help to diagnose fish diseases, teach fish farmers how to correctly use fish medicine and how to prevent fish diseases.

- Collective use of fishmeal

The fisheries cooperative responded to regular detection and monitor on the fishmeal used to the fish cages belonging to its members. In that way, fisheries cooperative can increase the safety of usage of fishmeal to avoid the case that fish farmers use unqualified fishmeal to lower their cost. At the same time, the amount of fishmeal used in the fisheries cooperative can be recorded.

The fisheries cooperative should keep in touch with Ningde Inspection and quarantine department to collect the information about the qualified fishmeal. With the development of fishmeal, new fishmeal product will be approved by the Inspection and quarantine department and sold in the market. It is important to collect those constantly updated information, choose the suitable selections and recommend that to the fish farmers so that the fish farmers can choose one or several of them to feed the fish with safety according to their finance situation.

- Collective inspection of fish fry

Buying fish fry and pulling them into cages is the first step of the whole aquaculture process. The quality of fish fry directly decided the quality of fish products and the stability of culturing process so that it is critical to use qualified fish fry to carry out aquaculture. In some context, the fish fry suppliers cultivated fish fry by inbreeding to reduce the cost. According to the Technical Specifications of Large yellow croaker Aquaculture, the brood stock of large yellow croaker must be harvested from the natural marine area or produced in the fish fry field owning large yellow croaker production licenses issued by the government. It is forbidden to use the inbred offspring as brood stock. For the purposes of standardizing the production, export and process fisheries cooperative controlled the quality of fish fry by detecting them before pulling them into the fish cages so that all the fish fry reached a minimum requirement of qualified fish fry to ensure the safety of aquaculture production and quality of fish products. Of course, fish fry field with good reputation would be recommended to the export and process fisheries cooperative to make a close link with each other for the stable production in future.

- Collective inspection of seawater

The export and process fisheries cooperative cooperated with the Marine and Fisheries Environment Monitoring Station belong to NOFB to select appropriate water inspection point in 21 sub-regions to carry out seawater inspection. They also collected the data of inspections and analyzed it before they report was pronounced to the fish farmers. Under such circumstances, fish farmers knew about their production situation more or less. Combining with the education of prevention of fish diseases and other fish disasters, fish farmers can adopt some measurements to deal with them along with the coordination with the NOFB and MFEMS while these two authorizes can also remind fish farmers of noticing the culturing situation when the seawater appears a warning signal. It not only monitor the process production, but also ensure the products quality.

- Collective purchase from fish cages to process companies

The sale of fish is always a headache for fish farmers. Sometimes they were oppressed by the middleman and merchant who purchased the fish at a unfair price. In the export and process fisheries cooperative, there is no middleman in

the middle of fish farmers and process companies. Fish farmers directly supply the export process companies in the cooperative. Further, the cooperative detected the fish several times before and after the purchase in order to ensure fish quality.

- Collective standard of fish products

All export process companies adopt the same standard of fish products that reach the requirements of custom and clients aboard.

- Collective original marking on all export products

In 2005, the local government of Ningde City has empowered the large yellow croaker association belonging to NOFB to register the mark of origin protection at State Bureau of quality supervision. After that, NOFB authorized the qualification of export and process companies in the fisheries cooperative. All these companies applied for the use of this mark to the NOFB and all the qualified export products must have this mark.

- Collective communication and coordination

The fisheries cooperative collected the feedback in the culturing production and in the sale process from fish farmers, fish processors, export and process companies and clients aboard and reported the result to the fish farmers to help them to improve their culturing production in correct points, especially according to clients' feedback. The fish farmers and stakeholders and governors would have discussions with each other about what and how to achieve the improvements and then they coordinated together to complete the goals. On the other hand, fisheries cooperatives represented all members to make decisions for expansion on business by taking of productivity, development plan and the market context into consideration.

The second step was the demonstration area and 1-organization +4-systems. In order to strengthen the effectiveness of governance of large yellow croaker aquaculture fishery, NOFB promoted the implementation plan of Ningde large yellow croaker quality and safety demonstration area in Jiaocheng District in Ningde City. Jiaocheng District is one of three regions that included in the export and process large yellow croaker aquaculture fisheries cooperative regions. In the demonstration area, NOFB coordinating with 12 other governmental departments such as Ningde government, Jiaocheng District government, Food

safety office, Local Agriculture department, healthy department, commerce and industry department and quality supervision department started the implementation of demonstration area. (China Aquatic Products Online)

The export and process large yellow croaker aquaculture fisheries cooperative still was the basic conception in the whole governance in the implementation of demonstration. However, the governance system was clearly divided and systematized, including a management system of safety and quality, control system of aquaculture and process, risk precautionary and reaction system and technology support and service system.

In addition, the requirement of waste disposal was more restrict in the demonstration area. Each fish raft in demonstration area placed trash bins to collect garbage every day. Garbage clean transport ship would clean up the living garbage and those floating on the sea surface twice a week and transport them ashore for incineration. Sick fish and dead fish would be harvested timely for harmless disposal. Fish cages and aquaculture gears and tools should be cleaned at a fixed point and the waster water and garbage would be processed though sterilization, sedimentation and filtration. The final garbage would be processed with living garbage.

Legal assistance and marketing promotion were also the highlights in the governance of large yellow croaker aquaculture fishery. With the lessons learning from the fisheries cooperatives of other countries and their own experience, the promulgation of the Law of the People's Republic of China on Specialized Farmers Cooperatives came into on 1<sup>st</sup> July, 2007, which provides fisheries cooperatives certain legal guarantee encouraging the inception of many new fisheries cooperatives later. At the end of 2002, the Chinese Ministry of Agriculture implemented a program called "Non Human Hazard Agriculture production." The aim of this program is to provide farmers and fish farmers guidance in how to farm their products according to required procedures and standards, and those products qualified will be labeled with the seal "Non human hazard agricultural products (FAO, 2005)." This label on the products indicates that the food security and safety has unified standards, signs, program, management and supervision. Since 2007, the

geographic label of large yellow croaker is over all used in the export products and the label is shown as Figure 4.



Figure 5 Geographic label of LYC in Ningde City, China (NDFA, 2015)

#### 4.3.3 Outcomes

- Recognition issued by the central government

In 2012, the demonstration area was approved as a national agricultural demonstration zone of export food quality and safety. The experts group of AQSIQ spoke highly of the Ningde large yellow croaker quality and safety demonstration area on the report meeting. They determined that the efficiency of demonstration area was remarkable in last three years and played a good role of demonstration and example to similar industries.

- Double increase on both economy and fish quality

With the advance of the demonstration area, the annual export amount of large yellow croaker substantially increased year by year. Especially in January-October, 2012, the export growth continued to expand up to \$ 53,045,000 that is an increase of 88.97%. The export unit price was increased from \$ 4,500 / ton in 2009 up to of \$ 6,811 / ton in 2012.

The price of large yellow croaker sold to export in the demonstration area was \$156 higher than that sold to national market while all fish farmers' income in 2012 was increased \$15.60 million (Ningde ,2012)

At the same time, the quality of fish products constantly increased and the fraction defective was declined from 2% in 2009 down to almost zero in 2011 and 2012 (Ningde ,2012). The reputation was increased. The good product quality won the trust of domestic and foreign customers so that the overall size of the export business was rapidly expanded.

- A quite mature management model for large yellow croaker aquaculture. The combination of fisheries export and process companies and fish farmers created a new model of. The two industries signed the cooperation agreement based on the economic benefit to achieve the governance of self-restraint, mutual supervision and collective management that completely reversed the previous situation of disorderly management.

The GSP (Good Safety practices) system of fish medicine and the GAP (Good Aquaculture Practice) system of fish culturing production built in the implementation area of fisheries cooperative, especially in the demonstration area, provided an example for all other fish farmers. There were 2 culturing fields in the demonstration gained the GAP license issued by the government and others all applied their internal management referring to the GAP system. The GSP system provided the many assured fish pharmacy that the fish farmers don not worry about the source of medicine and can learning more about how to select and use the medicine.

The 8 collective actions for the governance effectively solved the problems that the low knowledge of fish farmers, the non-standardized culturing and using of fish medicine and the process companies purchasing other fish out of the fisheries cooperative so that the fish quality was significantly increased and large ly strengthen the industrial development potential.

#### **4.3.4 Relation changes in fish farmers, stakeholders and governors**

The fish farmers culturing large yellow croaker worked only for themselves before they participated in the fisheries cooperative. Under such circumstances,

they competed with each other on culturing more fish in each cage and large r fish by feeding more fishmeal. But, what they did actually brought them a disservice as declining fish quality and environment problems that made the fish production more difficult. In addition, their fish cannot be sold in a reasonable price because they did not have the direct link with process companies while the middle-man and merchants usually gave them a price as low as possible to increase their benefit.

After the organization of fisheries cooperatives, their relationship among all fish farmers was turned into partner mode. The fisheries cooperative built a bridge for fish farmers and process companies so that they can discuss about the balance between the amount of export demands and the amount of large yellow croakers that were supposed to be cultured and then made an agreement or a contract on their cooperation. Thus, the security of fish farmers' income was stabled due to the agreements. Both of them can discuss a more appropriate price without the existence of middlemen or merchants. On the other hand, the governors could also make a pre-management program according to the agreements.

When the fish farmers fought alone, they had to take the 100% of any kind of production risk. No one will and can pay for their loss. For example, in later 2007, almost entire export industry of large yellow croaker aquaculture fishery was stopped because of the failure in South Korea market. A large amount of fish farmers had to sell their fish to middlemen or merchants at a very low price or continue to feeding the fish until someone want buy. All the loss and cost during that time were taken by the fish farmers themselves. Some of them even were broken. However, this kind of pressure on the fish farmers was released by the fisheries cooperative. As known, it is impossible to totally avoid the fish diseases occurrence so far. The fisheries cooperatives would help the fish farmers by taking the precautionary and emergency measurements to decrease as much loss as possible. If the situation is too bad to be saved, the fish farmers can get the minimum living requirement and the loan funded by the fish cooperatives while they need to return the loan when they get the profits. Thus, the fish farmers have the basic living standard at least.



According to those mentioned above, large yellow croaker aquaculture fishery can be regarded as a newborn aquaculture fishery that was formally developed into industrial aquaculture in the late of 1990s. All the government departments had only little experience about such fishery. So, only NOFB and its belonging departments presented significant management into large yellow croaker aquaculture fishery at the beginning. However, the NOFB's management was apparently not sufficient so that the quality of export fish could not reach the requirements of South Korea that almost destroyed the whole fishery. It is unfair to say that that NOFB did nothing for the large yellow croaker fishery because this fishery was original from NOFB.

As a local ocean and fisheries department, the NOFB has the obligation to solve the problems occurring in any fisheries activities and meet the demands requested by fishers, fish farmers and stakeholders while has the right to plan the development of all fisheries industry. The NOFB positively performed his obligations to solve the fish problems with other relating government departments. Its move made these departments who only preformed their own duties come together to cooperate with fish farmers and stakeholders for the same purposes.

#### **4.3.5 Interactions between fish farmers, stakeholders and governors**

The NOFB provided a governance model to the fish farmers and stakeholders. With the implementation of fisheries cooperatives approach in the large yellow croaker aquaculture fishery for the purpose of export and process, the quality of fish products was large ly increased due to the standardized culturing production. The collective action implemented by the fish farmers, stakeholders and governors in the manner of organizational form of fisheries cooperatives really worked very well so that the previous non- standardized production was totally changed into a standardized management and production system. At the beginning of governance, some fish farmers thought it was a constraint to their production as they were locked in a cage. Such attitude was totally changed when the governance of fisheries cooperatives worked and brought them economic benefits and declined the trouble of fish sick. Then, they operated all aquaculture production following the Technical Specifications of Large yellow croaker Aquaculture within full confidence.

The increased fish quality in large yellow croaker aquaculture fishery was one of the objectives that all fish farmers, stakeholders and governors were looking forward to completing. Such a success made the governance mode of fisheries cooperatives gain approval and support by government and the public so that it became a mature management system to manage the large yellow croaker aquaculture fishery. It is also regarded as a successful example to be introduced to other fisheries industry.

During the process of governance, according to the high requirement of communication in fisheries cooperatives, the fish farmers and stakeholders had more communication with governors about raising demands, making solutions, discussing agreements and planning the future than before. Fish farmers and stakeholders had a new role as participators involving in the governance. They decided their business with foreign clients and then self-governing and self-restraint in the aquaculture production to achieve the goals.

It made them learn more about each other and the large yellow croaker aquaculture fishery. The mutually supportive relationship existed between the governors and fish farmers and stakeholders saved the large yellow croaker fishery and promoted its development.

Possible changes in future

So far, the problems on product quality and standardized production almost be solved. The fish farmers and stakeholders are considering about expanding their business and production. But it is difficult to achieve the expansion in terms of the present aquaculture mode. Fish farmers and stakeholders are interested in the information about advanced aquaculture methods in developed countries.

There is a research that determined the large r cages culturing large r groups of large yellow croaker could stimulate the activity of large yellow croaker in the water for speeding up their growth rate and increasing quality. If it is possible that fish farmers master sufficient finance condition, they are willing to reform the culturing gears and tools that is what they are looking for now.

However, introducing high technology is usually expensive and difficult. The governors suggest that do not carry out any large-scale reform without understanding it totally. It will still take a certain time for fish farmers to wait for the advanced technique that is worthy to wait.

Besides, the population of fish farmers and number of cages are too large due to the disorder development before. Now, taking the considerations of environmental pressure and development of large yellow croaker aquaculture fishery, a restructure is likely to be taken place.

#### **4.4 Summery**

The organizational form of fisheries cooperatives is successful in solving problems of Ningde large yellow croaker aquaculture fishery. The goals of recovering the export trade of large yellow croaker are achieved in 5 years and it was expanded in the next 3 years to many countries out of Asia.

The fisheries cooperative organized by fish farmers and stakeholders in large yellow croaker aquaculture fishery connected the distributed fish farmers and implement the collective action following collective standards for the export market. It also cooperated with the NOFB and other relating government departments to detect and monitor the quality of fish and culturing environment and teach the fish farmers the correct usage of fish medicine. They built a governance system including internal self-governance in the fisheries cooperative and external governance form government with standard culturing production and sufficient MCS.

This case also gave a warning to other similar aquaculture fishery that it is time to estimate whether such governance should start to avoid the similar product problems.

## Chapter 5 Discussion

In the SSF fisheries governance, the interaction between each system can reflect a lot of information about the implementation of fisheries cooperatives approach. Fishery is a system including social, natural system and the governing system. Separate action in any of them cannot work very well in the governance without the response and reflect of other systems. For instance, the fish quality is the main problems that need to be solved in LYC aquaculture fishery. The governors implement the measurement of standardizing the culturing production and strengthening the MCS. But no fish farmers response to that and they still culture the fish with the way they like. They play gamble when they meet the MCS. There will be nothing happened to be good to the LYC aquaculture fishery. Everything is as same as before while the governors take a lot efforts but harvest nothing, vice versa.

The interaction among fish farmers is the self-governing interaction. They work in the same way following the same standard everyday and they know most about each other. The fisheries cooperatives is not only the way to gather them together for their common requirements, but also the manner in which social discontent is transformed into organized action has always been a key issue in social movement et literature (Maarten al, 2013).

The interaction between the governors and fish farmers and stakeholders is hierarchical governing interactions. The governors settled the policies on the relating measurements to governing the social system and natural system at the certain degree. This degree is not a restrict one. The governors should provide the fish farmers and stakeholders a free exploiting space instead of a comprehensive bondage.

The interaction between fish farmers and stakeholders is a co-governing interaction. In the field of social-political governing, parties may collaborate, cooperate, co-ordinate and communicate 'sideways' without any one actor playing a central or dominating role (Maarten al, 2013). This is what happened in the fisheries cooperatives when the governors do not work well. Fish farmers and

stakeholders have no leaders to follow so they have to save themselves. The mutual independence makes them preferring to share the responsibility. Fisheries cooperatives approach to govern SSF, of course, cannot fit all kinds of SSF. According to the knowledge of organizations and collective action in SSF, the understanding of fisheries cooperatives approach and learning from the case study of Ningde large yellow croaker fishery as a governability assessment of fisheries cooperatives approach, the pros and cons of fisheries cooperatives approach in governance are showed in the Table 2.

**Table 2 STOW analysis of fisheries cooperatives approach in SSF**

	Strengthen	Weakness
Internal	Increase the operational capability Self-management saving effort Achieving common goals	Its capability is not strong Difficult to have a same development direction
	Opportunity	Threats
External	Conducive to development to big market A vehicle of introducing new technology to traditional fishery	Changing environment makes it difficult

### **Strengthen**

The operational capability is strengthened with the establishment and functioning of fisheries cooperatives. The fisheries cooperatives bring the dispersed fishers into group. When the members in the fisheries cooperatives take the collective action, every outcome should have a certain standard. For example, in harvesting fishery, a certain time and certain fishing gears and nets are taken as collective action in governance. Then the size and weight harvested

fish will be located in a certain range that will not have a negative effect on the fish resources.

The self-management in fisheries cooperatives saves a lot of effort for both governors and the governed. In the fisheries cooperatives, fishers and fish farmers self-manage the operations and productions following relating rules rather than be totally controlled by the governors. The self-management makes the fishers and fish farmers well known about rules and standards that they feel more participation in the fisheries cooperatives on fish production and their responsibility will make them not only self-control but also mutual supervision and help with the others.

On the side of governors, the management of governance is divided to both the governed and the governors so that the governors can pay their attention to the more important and complex issues that are not easy to deal with and the governed have no ability to handle. Thus, the governance cost including finance and effort can be saved and the governance remains ordered.

The success of governance means the goals that are the collective requirements of a large number of population are satisfied. In the fisheries governance, especially SSF, these successes contribute to various aspects in society. Sometimes are economical, sometimes are social sometimes are national or even international.

### **Weakness**

Compared other cooperatives or other organizations, fisheries cooperatives are not strong enough. According to the nature of the members who are fishers, fish farmers and stakeholders, their integrated capability remains too low to develop and innovate themselves. The supports such as finance, technique and policy will always be needed. It will be possible that some people who harbor evil intent designs will take advantage of this situation to gain their personal purpose instead of helping those poor people. They will be likely to be abandoned and the fisheries cooperatives are over when the supporters leave.

It is also difficult to discuss a same and optimal development by fisheries cooperatives. The decision is made by all the discussion within all members in fisheries cooperatives. Usually they require the demands that are needed in daily life in practices. These requirements are concrete and a lively image of what collective action should be implemented to achieve them and a clear vision of

success will appear in all members mind. However, it is understandable that every member has his/her personal idea about fisheries career. When this kind of internal contradictions cannot be well mediate, it is likely to threat the stability of the fisheries cooperatives and even raise the failure.

### **Opportunities**

The market of SSF is normally local market or even no market. It is easy to have a basic life but difficult to exploit additional business when they are restricted by their productivity and market. The fisheries cooperatives coheres the dispersed fishers, fish farmers and stakeholders to an organization while their productivity can reach the demands on the big market such as international export market of large yellow croaker aquaculture fishery.

The fisheries cooperatives often became the main vehicle for delivering 'modern technology' in fisheries to those communities who were considered the 'traditional, ignorant, unorganized, artisanal fishers (FAO, SOCAF, 50). In many contexts of SSF globally, the unavailability of correct fishing gears and nets and lack of money are the main problems that raise the coastal fish resources collapse and high -risk production in fishery. Fisheries cooperatives improves this situation at a certain level by collective action, and at the aggregated level of the fish economy, there was considerable infusion of credit, fishing requisites and new technology through the aegis of cooperatives (FAO, SOCAF, 50).

Members in fisheries cooperatives have more financial capability and willingness to buy and use new fishing gears and nets due to the nice vision in their mind.

### **Threats**

Environment and market are changing at every moment. It is necessary that the fisheries cooperatives need to sculpt themselves to fit those changes.

However, sometimes the changes of environment and market are too fast or large that the capability of fisheries cooperatives cannot reach. It is really sad for those fishers, fish farmers and stakeholders because of their disappointment and frustration.

## Chapter 6 Conclusion

In the historical development of fisheries cooperatives, their reputation was a mixed record. But they still survived until now and came back to the stage of SSF governance in the new manner. On one hand, many people were scared by the failure case of fisheries cooperatives so that they will never have any connection with them in SSF governance. On the other hand, some people still admire this governance approach and introduce them to their SSF governance. In my humble opinion, fisheries cooperatives approach always has potential in SSF governance as long as you know how to apply them. In order to understand the governability of fisheries cooperatives approach in SSF governance, the research questions are listed as:

- How do fisheries cooperatives impact the governance of SSF aquaculture fishery?
- What are the cons and pros of fisheries cooperatives in governance of SSF aquaculture fishery?
- How should the fisheries cooperatives do to be sustainable in aquaculture fishery?

### 6.1 Functions of fisheries cooperatives

Fisheries cooperatives are the cohesion of power, wealth and wisdom. Fisheries cooperatives are organized by fishers, fish farmers and stakeholders for the common purposes applying self-help, self-governance and self-responsibility. In the fisheries cooperatives, the relation among members is independent and mutual-cooperative. Every member is equal to the others without any hierarchy relation. The common objectives and collective action connect build a bridge of cooperative for the members. Any action that violates to the collective action and will hinder the progress of governance is not allowed to exist and only the promoting action can be acceptable. There will be a positive direction of collective action appearing in the internal governance in fisheries cooperatives. The fund for functioning of fisheries cooperatives can come from different sources. It can be loan from bank or other supporters as well as can be invested by the member. But it is worth to notice that the members who are also investors will still be common members of fisheries cooperatives without any priority.



They have to compliance with internal regulations of cooperatives as other members.

All the members are one of the decision-makers in the governance. They undertake the responsibility of governance and share the benefit from the success. Especially when facing the difficulties, members should jointly overcome the difficulties to turn the big problem to small problem by common wisdom and power.

Fisheries cooperatives can achieve the governance goals effectively. The governance goals come from those problems widespread occurring on members and frequently taking place in fisheries production. Their achievements mean that the most principle and the most common problems are solved so that a large worry is released. Compared with the dispersed fishers, fish farmers and stakeholders, it is more efficient to solve one common problems in one time than solve individual problems one by one.

Cons and pros of fisheries cooperatives in SSF governance

As we mentioned in Discussion, the cons and pros of fisheries cooperatives in SSF governance can be concluded as follows:

Fisheries cooperatives can ensure the quality of fish products. Fisheries harvesting and aquaculture can also produce fish products as same as the assembly line in factory with a collective standard and collective action. Fisheries cooperatives can become the vehicle of introducing new technology. Buying new technology by the unit of fisheries cooperatives can save the cost, which makes the technical renew easier than individuals. FAO (2012a) also confirmed that the negotiating ability and the competition ability in market would be increased so that the members can get rid of the disadvantage in marketing.

On the contrary, the capability of fisheries cooperatives is still quite low so that the external support is prerequisite, especially on the introduction of new technology. Even sometimes, they cannot response the external changes to adjust them so as to go straight to failure.

## **6.2 Being sustainable fisheries cooperatives**

Fisheries cooperatives approach is a flexible governance approach. The fisheries cooperatives approach can be likened to water, and the context of their location is likened to the water containers. No mater what shape the water container is,

the water will always fill in every place of the container by its liquidity. From the organization of fisheries cooperative to their adjustment in future, the flexibility of fisheries cooperatives can be seen everywhere. For example in the LYC aquaculture fishery, the fisheries cooperative was organized by the fish farmers and the export and process companies to avoid the problems of insecurity of fish quality and fish farmers' income caused by the middlemen. The fisheries cooperative directly built a purchase platform for the fish farmers and export and process companies. In addition, the fisheries cooperative also collaborated with the LYC association that is organized by all stakeholders in LYC fishery apply for the geographic label for the export LYC fishery to meet the needs of the international market and build their own brand.

More confidence and patient should exist between the governors and the governed. Sometimes, the reason of failure would be blamed to the non-response of governors. But some governors were also helpless when even they cannot achieve the fishers, fish farmers and stakeholders' requirement. For instance, fish farmers ask for new technology to increase the productivity to enhance their business. But, it will take some time for the researchers to work on it, not mention that it is difficult to predict the research time of one scientific research. In this context, fishers, fish farmers and stakeholder please do not lose you confidence to the governors and the researchers, you should continue to inquire about its progress and feel happy if it is under researching. Meanwhile, all the members in fisheries cooperatives can help to collect and record the information in your daily production to provide the research institution more data support. In a word, do not abandon the confidence, try to help each other in any way and keep contact and communication all the time.

### **6.3 Space and time for governance and development**

To governors, fisheries cooperatives are not established for you to control the fishers, fish farmers and stakeholders, but to give them space and time to self-help, self-governance and self-responsibility. Macro framework of governance such as the requirement of production safety, environmental conversation and the welfare of fishers, fish farmers and stakeholders should be provided by the states, but the development of fisheries cooperatives and even strategy of relating industry can hand to the fisheries cooperatives and professor.

No matter what kind of situations of SSF governance, the cohesion of fishers, fish farmers and stakeholders by fisheries cooperatives should be taken advantage as much as possible only because they have the right, qualification and capability to self-govern, they have the talent and creativity to exploit themselves and they are worth to be trusted.

## Reference

- Bondad-Reantaso M.G. & Prein, M. (2009). Measuring the contribution of small-scale aquaculture: an assessment. FAO Fisheries and Aquaculture Technical Paper. No. 534. Rome, FAO. 2009. 180p.
- HLPE (2014). Sustainable fisheries and aquaculture for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2014.
- FAO (2005). National Aquaculture Sector Overview, China. National Aquaculture Sector Overview Fact Sheets. FAO Fisheries and Aquaculture Department. Rome. Updated 1 February 2005.  
[http://www.fao.org/fishery/countrysector/naso\\_china/en](http://www.fao.org/fishery/countrysector/naso_china/en)
- FAO (2005a). World inventory of fisheries. Impact of aquaculture on environment. Issues Fact Sheets. FAO Fisheries and Aquaculture Department. 27 May 2005. <http://www.fao.org/fishery/topic/14894/en>
- FAO (2009). Report of the Global Conference on Small-scale Fisheries: Securing sustainable small-scale fisheries: Bringing together responsible fisheries and social development. Fisheries and Aquaculture Report No. 911. Rome. 189 pp. [www.fao.org/docrep/012/i1227t/i1227t.pdf](http://www.fao.org/docrep/012/i1227t/i1227t.pdf).
- FAO (2012). The State of World Fisheries and Aquaculture 2012. Rome. 209 pp.
- FAO (2012a). Cooperatives in small-scale fisheries: enabling successes through community empowerment. International year of cooperatives issue brief series. Bangkok. 2012
- FAO (2014). The State of World Fisheries and Aquaculture. Rome. 223 pp.
- J. Kurien (2014). Collective action and organisations in small-scale fisheries. Strengthening organizations and collective action in fisheries – a way forward in implementing the international guidelines for securing sustainable small-scale fisheries. FAO Workshop, 18–20 March 2013, Rome, Italy. FAO Fisheries and Aquaculture Proceedings No. 32. Rome, FAO. 168 pp.
- Kalikoski, D. & Franz, N., eds. (2014). Strengthening organizations and collective action in fisheries – a way forward in implementing the international

guidelines for securing sustainable small-scale fisheries. FAO Workshop, 18–20 March 2013, Rome, Italy. FAO Fisheries and Aquaculture Proceedings No. 32. Rome, FAO. 168 pp.

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