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FISHERY AND AQUACULTURE INSURANCE IN CHINA

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PREPARATION OF THIS DOCUMENT

The paper is based mainly on the information from interviews conducted in Anhui, Fujian, Jiangsu, Sichuan and Zhejiang provinces during August–September 2015 by a research team of the Freshwater Fisheries Research Centre (FFRC) of Chinese Academy of Fishery Sciences. FFRC, located in Wuxi, Jiangsu province, is FAO’s reference center for aquaculture and inland fishery research and training. Key informants were the insured, leaders of associations and cooperatives, officers of insurance mutual associations, insurance companies, inspectors, technical staff and officials of government agencies in various levels.

Mr Zhang Weiguang, Director of Underwriting (Aquaculture Insurance) Department of the China Fishery Mutual Insurance Association, Associate Professor Dr Shu-Ling Chen of the Department of Finance and Cooperative Management of the National Taipei University, and Dr Susana Siar, Fishery Industry Officer of FAO Rome, provided valuable comments. Mr Pedro Bueno did the language edit.

The draft paper was refined following comments at the FAO regional workshop ‘Development of aquaculture insurance system for small-scale farmers’, held in Bangkok on 20–21 September 2016, in which it was presented as one of the resource papers by Dr Ming Junchao of FFRC.

The definitions of insurance terms used in this report can be found in Annex 5 ‘Glossary of common terms used in crop, livestock and aquaculture insurance’ of the FAO Agricultural Services Bulletin 164 – *Livestock and aquaculture insurance in developing countries* authored by Roberts (2007).

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ABSTRACT

This paper reviews the organization, policy development, regulatory framework, innovations and mechanisms that support the establishment of the fishery and aquaculture insurance system in China. Cases in marine and inland capture fishery, and finfish, crab, shrimp and seaweed farming are described. Lessons are drawn on (i) the need for a clear policy and legal framework for commercial and mutual insurance, (ii) the importance of establishing and strengthening a national insurance infrastructure, (iii) the role of government in the financial support of an insurance programme, (iv) development of innovative and diversified insurance products that fit clients' needs, (v) promoting awareness and understanding of insurance as a risk management strategy among fishers and farmers, government officers, financial institutions and other service providers, (vi) reducing the risks and thus increasing the benefits to both insurer and insured with incentives that encourage farmers to adopt better management practices, (vii) building a wide pool of participants to sustain the viability of the insurance business as exemplified by the China Fishery Mutual Insurance Association, and (viii) expanding the social responsibility role of the national insurance system to include assistance to communities for mitigating the impacts of catastrophes, guidelines and logistics for a systematic post-disaster relief operation, and assistance to enable communities to recover from the impacts of a disaster.

China has a long history of fishery development, achieving remarkable increases in productivity and prosperity for its fishers and fish farmers through technological improvements and good sector management. To sustain these gains, the government has accorded a high priority to insurance as a risk management strategy. In 1982, the People's Insurance Company of China started providing insurance to fishing vessels. The number of insured increased during 1990s, but the indemnities paid were high compared to premiums earned (i.e. high loss ratios). Later, the company focused only on large-scale fishing operations. In 1995, it started an aquaculture insurance pilot programme. It was stopped in 1996 due to the high frequency of disaster events that resulted in high loss ratios.

In 1994, the China Fishing Vessel Owner's Mutual Insurance Association was founded in Beijing. Renamed the China Fishery Mutual Insurance Association or CFMI in 2007, the association provides fishery mutual insurance for vessels, vessel owners' liability, and death and injury on board. Fishers became members of the association by paying the insurance premium. CFMI is an infrastructure for a collective-based mutual assistance approach that helps mitigate disaster risks and improves resilience. The association carries out the majority of China's insurance programme.

In 2012, CFMI launched a pilot mutual insurance programme for aquaculture. There are two main aquaculture insurance pilot models in China: mutual and commercial. Both receive significant insurance premium subsidies from local governments. Commercial insurance could be a collaboration between local government and a private insurance company or between a private insurance company and a farming cooperative. The variety of insurance products piloted include indemnity-based and index-based types. For the first type, named-peril insurance is used, which usually covers natural disasters and some diseases. The index-based type includes wind speed, temperature and hydrological parametric insurance for some species such as sea cucumber, mitten crab, seaweed and oyster.

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ABBREVIATIONS AND ACRONYMS

CFMI	China Fishery Mutual Insurance Association
CPIC	China Pacific Insurance Company
FAO	Food and Agriculture Organization of the United Nations
FFRC	Freshwater Fisheries Research Center of Chinese Academy of Fishery Sciences
GDP	Gross domestic product
JFMI	Jiangsu Fishery Mutual Insurance Association
MOA	Ministry of Agriculture
PICC	People's Insurance Company of China
ZFMI	Zhejiang Fishery Mutual Insurance Association

Units of measure

1 hectare (ha) = 15 mu

USD 1 = CNY 6.5 in average at the time of the study (2015)

1. INTRODUCTION

The fishery industry of China has made remarkable and significant progress. In 2014, the total fishery production both from capture and culture was nearly 65 million tonnes (Bureau of Fisheries of Ministry of Agriculture of China, 2015). This was around one-third of the world's fishery production. The total value was CNY 1 086 billion, contributing 10 percent of the annual agricultural production value or 4 percent of GDP. The export volume was around 4 million tonnes or 6 percent of the total production. There were more than one million vessels fishing in the world's oceans and in China's inland water bodies. The total aquaculture area was 126 million mu, of which 91 million mu (72 percent) was for freshwater culture and 35 million mu for mariculture. Aquaculture production was 47 million tonnes, which was 73 percent of total fishery production. The entire fishery industry provided job opportunities for more than 20 million.

Fishery is a high-risk sector. The high dependence of the economy on fishery makes it more vulnerable to risks. There have been significant damage to vessels, loss of lives and serious injuries caused by different kinds of disasters, such as collision, rainstorm, windstorm, machinery failure, on-board explosion and other accidents. Production loss and facilities damage in aquaculture are caused by technical failure, red tides, diseases, flood, typhoon, storm, water pollution, high temperature and frost, and other hazards (Zeng Xingcun *et al.*, 2011). In the five-year period from 2010 to 2014, disasters caused a total damage and loss to fishery and aquaculture of around CNY 117 billion, an average of CNY 23 billion a year (Table 1).

Table 1. Damage and loss caused by disasters in China, 2010–2014

Type of damage and loss	2010	2011	2012	2013	2014
Capture fishery					
• number of boats sunk	598	646	874	847	1 255
• life loss and injuries (person)*	242	142	164	165	88
Aquaculture					
• area affected (million mu)	20	25	16	16	12
• production loss (million tonnes)	1.7	2.3	1.4	1.6	1.3
Total economic loss (CNY billion)	20.5	25.8	23.7	25.7	21.2

Note: * dead, missing and seriously injured.

Source: Bureau of Fisheries of Ministry of Agriculture of China (2015).

The various risks have caused huge economic loss, in production and damaged facilities, to fishers and farmers that are often beyond their capacity to recover. Insurance was thus considered for the sector as a means to improve its resilience to risks and to protect the industry. Improvement of risk management capacity through insurance is a priority of the Chinese government. The sector was deemed an important part of the overall agriculture insurance system. Chinese agriculture insurance is second in the world and first in Asia in market value.

The fishery insurance system has been established in the country for three decades. However, a large portion of the fishers has inadequate awareness of insurance schemes or lacks the knowledge to effectively avail of insurance services. Because of limited information, resources and education, the exchange of lessons from insurance needs to be intensified to help fishers and farmers improve their awareness of the insurance schemes and access to insurance services. There is also need to improve the insurance management and government's policy support, which would involve not only government policy makers but also commercial insurance companies, fishery administration, fishers and farmers. The characteristics as well as capabilities relevant to risk management of each stakeholder have to be described.

This paper provides information on the status of fishery and aquaculture insurance in China. It highlights the development of the policy and legal framework and the mechanism that support the establishment and implementation of the insurance programmes. This includes a review of risk perils, insurance schemes, and the performance of insurance programmes in selected cases.

Lessons from the insurance programmes and practices would provide a good basis for delivering support for a more sustainable insurance implementation. The information and experiences from China would contribute to the development of policies, laws and organizations as well as technical aspects to support insurance programmes.

2. HISTORY AND THE DEVELOPMENTAL PHASE

A fishery insurance programme was initiated in 1982 by the People's Insurance Company of China (PICC). It was part of the company's agriculture insurance services. The scheme covered loss of life and injury from accident and damage to fishing vessel caused by typhoon, storm and other natural disasters (Hu Jiahui and Wang Xiaobo, 2006).

In 1984, a pilot programme on commercial insurance for fishing vessels was implemented in the cities of Changdao and Laoshan in Shandong province; 108 fishing vessels were insured with a premium income of CNY 1.8 million. In that year, eight vessels suffered damage from strong winds for which the PICC disbursed CNY 40 000 in compensation. In 1985, the province improved and expanded the insurance programme. The Fishing Port Inspection Service Centre was authorized to provide insurance service to fishers. That year, 15 584 fishing vessels were insured with a premium income of CNY 3.8 million. There were 3 633 claims for compensation from accidents and a settled compensation of CNY 3.3 million. The loss ratio was 87 percent.¹ By 1991, the number of fishing vessels insured in Shandong had reached 100 000; total premium was CNY 114 million and the indemnity paid was CNY 80 million for a loss ratio of 70 percent. Still this was deemed not profitable when the management and administrative costs as well as expenses for product distribution and promotion were included. The programme was stopped in 1991 (You Guiyun, Deng Yumei and Du He, 2012).

In 1995, the PICC began to insure aquaculture on a pilot scale, covering around 2 percent of the total aquaculture area in China. It received a total premium income of CNY 9.3 million. The indemnity paid was CNY 18.3 million. The loss ratio was almost 200 percent although in shrimp insurance the loss ratio was reported to be 1 440 percent (Ge Guanghua and Lou Yong, 1997).

This placed the insurance for fishery and aquaculture in the high-risk category. After reviewing the frequency of damages to fishing vessels, the PICC decided to provide insurance only to bigger vessels, to steel-hulled boats (not to wooden boats), and to deep-sea fishery. Insurance for aquaculture was stopped in 1996 because of the high occurrence of disasters abetted by poor farm management. The pilot commercial insurance programmes for fishery and aquaculture were deemed unsuccessful (Tong Chunfen and Yin Yue, 2014).

This situation led to the establishment, with the approval of the Ministry of Civil Affairs, of the China Fishing Vessel Owner's Mutual Insurance Association in 1994 (it was renamed the China Fishery Mutual Insurance Association or CFMI in 2007). The association was affiliated with the Ministry of Agriculture (MOA). It was a non-profit organization and initially joined on a voluntary basis by owners of fishing vessels. Its headquarters office is in Beijing and has nine provincial associations and 30 offices in various provinces. It aims to provide mutual insurance for vessels, life loss and accidents (resulting in death or injury) during fishing activity. From 1994 to 2007, CFMI had insured more than 150 000 fishing vessels and 3.2 million fishing workers, and paid a total indemnity of CNY 500 million for 1 145 totally damaged fishing vessels, 25 402 partially damaged vessels, 5 339 dead and 19 348 injured fishing workers (Sun Yinshi and Li Dongxiao, 2009; Dong Zilong, 2013). In 2013, it insured more than one million fishing workers and 70 000 fishing vessels with a total insured value of CNY 260 billion.

In 2012, CFMI initiated a pilot insurance programme for aquaculture in partnership with commercial insurance companies and aquaculture cooperatives and associations. In that year the aquaculture area under the insurance programme was around 80 000 mu, which was less than 1 percent of the country's total aquaculture area (Qin Lu and Zhai Liushuan, 2015).

¹ Loss ratio is the proportion of indemnity paid to premium earned by the insurer.

Indemnity paid by a mutual insurance programme was partial compensation for the total economic loss from a disaster. In 2004, for instance, Typhoon Ranim wrought heavy damage on the fishery sector in Zhejiang province with a direct economic loss of CNY 18.1 billion. The compensation was CNY 1.7 billion, which included the insurance indemnity, government disaster relief fund, and public donations. The total compensation was around 10 percent of the total economic loss (Qin Lu and Zhai Liushuan, 2015). In 2014, Typhoon Ramasun caused about CNY 2.8 billion economic loss in the marine fishery and aquaculture industries of Hainan province. The government relief fund of about CNY 25 million was less than 1 percent of the total economic loss. This prompted a high demand for insurance, which would have provided additional compensation for the loss.

3. INSURANCE SYSTEM

The two modes of fishery and aquaculture insurance in China are commercial and mutual. Commercial insurance is provided by private companies under the supervision of the China Insurance Regulatory Commission of the State Council. Mutual insurance is operated under the MOA (Figure 1). The legal status of mutuals was unclear at the initial stage. In 2015 the status of mutuals became legally recognized as the commission started promulgating the supervision measures of mutual insurance organizations.

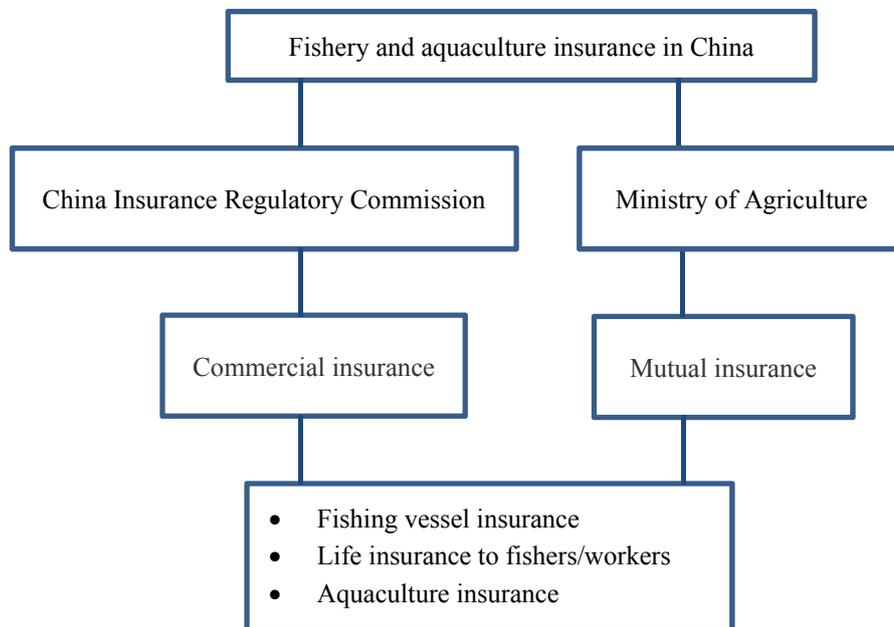


Figure 1. The fishery and aquaculture insurance system in China

The insurance companies have extensive service branches at the provincial and county levels. In some provinces, aquaculture insurance is piloted by commercial companies. This was encouraged by the local governments under the agriculture insurance programme.

Mutual insurance has the following characteristics. It is non-profit and a self-supporting organization. It operates at a low cost and charges low premium to attract the participation of fishers and farmers. It is owned by fishers and farmers who are the insurance buyers and stock holders; as such they are expected to protect their own interest, which avoids adverse selection² and moral hazard³, the two widely recognized major problems of traditional and non-mutual insurance. It helps fishers and farmers cope with risk impacts. The members of a mutual share information and experiences in disaster management through training and extension. Currently, mutual insurance in China is the preferred scheme by fishers and farmers. The major source of funding is from premium income.

² Adverse selection is also called anti-selection. It results from asymmetry of information available to the parties to an insurance contract. A high-risk person may use his or her private information to get an advantage on buying insurance, while the insurance premium may be set at the average risk. The insurer invariably incurs a loss.

³ Moral hazard occurs when the insured can influence the claim by exacerbating physical loss through his/her behaviour.

Other sources of funds include government subsidy, donations, income through service provision, bank interest, and other legal sources.

CFMI consisted of voluntary fishers, farmers and organizations involved in fishery nationwide and in aquaculture pilot areas. It sought to provide compensation to asset damages and life loss through mutual support, improve the capacity for disaster risk management, and promote sustainable production and development.

CFMI operates through its 30 local offices. Table 2 shows the location of its main branches and the years they were established. The offices implement mutual insurance using the contract documents prepared by headquarters. CFMI encourages the provincial and local governments to endorse the mutual insurance programme and to provide subsidy to the insurance programme.

Table 2. China Fishery Mutual Insurance and its major associations

Name	Location	Year established
China Fishery Mutual Insurance Association*	Beijing	1994
Guangdong Fishery Mutual Insurance Association	Guangzhou	1993**
Zhejiang Fishery Mutual Insurance Association	Hangzhou	2004
Shandong Fishery Mutual Insurance Association	Jinan	2006
Jiangsu Fishery Mutual Insurance Association	Nantong	2008
Hebei Fishery Mutual Insurance Association	Qinhuangdao	2009
Liaoning Fishery Mutual Insurance Association	Dalian	2011
Fujian Fishery Mutual Insurance Association	Fuzhou	2011
Hainan Fishery Mutual Insurance Association	Haikou	2013 (stopped in 2015)***
Ningbo Fishery Mutual Insurance Association	Ningbo, Zhejiang	1996

Note: * Formerly the China Fishing Vessel Owner's Mutual Insurance Association; renamed CFMI in 2007. **It was requested to implement a pilot in 1993; in 1994 the national mutual association was established. *** The loss ratio was high and beyond the capacity of the local government to support.

Source: CFMI website at www.cfmi.org.cn

The local associations independently operate their programmes, using their own legal representatives and premium earned. They also receive financial support from central and local governments. The associations share the risks from their insurance policy portfolios with CFMI and some with commercial insurance companies through reinsurance. This would allow the local associations to hedge against undesired exposure to loss. It also frees up capital for new insurance contracts. This practice improves the associations' risk management capability. For example, in Shandong province, the fishery and aquaculture insurance were operated by the Shandong Fishery Mutual Insurance Association and its branches. It shared part of the risk with CFMI and insurance companies. The MOA, Shandong Department of Marine and Fishery, and the local government provided the premium subsidy and granted a favourite tax (i.e. granting partial or total business tax exemption to the insurance provider) to support the insurance programme (Figure 2). Three companies participated in the scheme: Ping An Insurance (Group) Company of China, PICC, and China Continent Insurance.

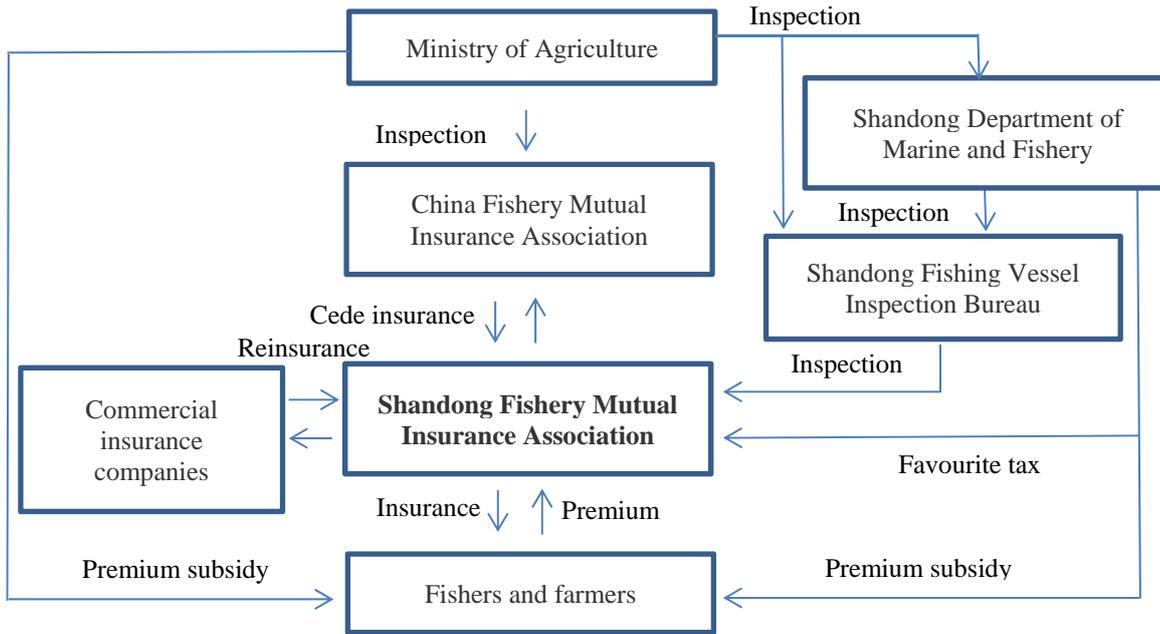


Figure 2. Operational structure of the fishery mutual insurance in Shandong province

The coverage provided by mutual insurance includes total or partial damages to fishing vessel, engine and fishing gears, boat owners' liability, life and medical insurance for fishers, and loss of aquaculture production (Table 3).

Table 3. Insurance coverages of fishery and aquaculture mutual insurance in China

Category	Coverage
Vessel insurance for total damage	Full damage to fishing vessel, caused by accident, disaster, boat sunk or missing or could not be repaired.
Comprehensive vessel insurance	Partial damage of fishing vessel, fishing gear and equipment caused by accident or disaster. This also includes costs of the following items: assistance to save the stricken vessel, examination of vessel hull when it ran aground or hit a rock, salary and living expenses while repairing the vessel after an accident, damages to fishing harbour or landing port, assistance fees, injury, death, life-saving expenses during collision, and legal expenses incurred during litigation.
Life insurance for fishers	Death or injury on board and medical expenses
Liability of fishing vessel owner and additional medical insurance	Group insurance for workers on board that include loss of life, medical and disability compensations caused by accidents or disasters.
Aquaculture insurance (started in 2012)	Production loss caused by natural disasters, diseases, and technical failure. Index-based insurance, using hydrological index, wind speed and temperature parameters, has also been piloted.

Source: CFMI at www.cfmi.org.cn

In 2008, the MOA allocated CNY 10 million for premium subsidy to support vessel owners' liability insurance for their workers (20 percent) and full damage of fishing vessels (25 percent). This support was provided to seven provinces, namely, Liaoning, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong and Hainan. It attracted subsidies of CNY 86.8 million from the local governments. This boosted the number of fishers participating in the insurance scheme. By 2008, the total fishery premium income had reached CNY 500 million (Sun Yinshi and Li Dongxiao, 2009).

In 2010, the total subsidy from central and local governments for fishery mutual insurance premium was CNY 330 million. This benefited 5.8 million fishing workers and 360 000 fishing vessels, with an insured amount of CNY 385 billion (Yu Yaguai, 2010).

In 2014, Fujian provided fishery mutual life insurance to 107 388 fishers (participation rate was 55 percent) and non-life insurance to 10 352 fishing vessels (participation rate was 18 percent). The total premium income was CNY 161.3 million and the sum insured was CNY 40.6 billion. The provincial government provided a premium

subsidy of CNY 41.6 million. In the same year, Hainan provincial government developed a guideline on agriculture insurance for the province. The major provisions include increasing the insured value for accident insurance and life insurance to CNY 200 000 and CNY 400 000, respectively, with a premium subsidy of 60 percent. Boat insurance also received a premium subsidy of 60 percent.

4. POLICY SUPPORT AND MECHANISM

Under the China Fishery Law, the China Insurance Law, and the Regulations on Agriculture Insurance, the policy-oriented fishery insurance programme was drafted and endorsed by the People's Congress of China. The Document No.1 of the central government emphasizes the establishment and implementation of the programme.

Due to the low income of fishers and farmers as well as their limited capacity to manage risks, the membership and capital of mutual insurance associations were very limited. These spurred the request for government support. Under the 'policy-oriented insurance programme', the local governments are encouraged to provide premium subsidies, and the local mutual associations provide insurance services in collaboration with CFMI and insurance companies. The government policy also aims to reduce the operational cost of the insurance programme.

CFMI has updated its association constitution and its organizational structure, management, legal status and operational rules such as identification of risks, evaluation of assets and life loss, injury, compensation schedule and clarification of responsibilities of insurance providers and buyers.

The laws and their enabling mechanisms that support the establishment and implementation of the insurance programme at national and provincial levels are described in the next section.

4.1 National policies and law

The Constitution of the People's Republic of China declares that providing social security to citizens is a basic responsibility of the government.

In the Agriculture Law of China (that came into force on 1 March 2003), Article 46 states that the government has to establish and implement the agriculture insurance system; establish and implement a policy-oriented agriculture insurance system; encourage and support the agriculture operators to organize and establish mutual insurance organizations and carry out insurance programmes for agriculture production and activities; and encourage commercial insurance companies to provide agriculture insurance programmes. This corresponds with the Insurance Law of China (enforced on 1 October 2009), Chapter 8, Article 186, which states that the government must support the insurance for agriculture production and services. The law defines agriculture insurance while its administrative regulations are provided in separate documents.

Since 2004, Document No.1⁴ promulgated by the central government, has emphasized the importance of agriculture insurance policy and advocated the diversification of agriculture insurance through commercial and mutual insurance. This covers fishery mutual insurance, which has been part of the measures to promote rural development. The initiatives that are in line with and supported by the Document are:

- establishment of a policy-oriented agriculture insurance system (2004);
- promoting the pilot programme of policy-oriented agriculture insurance (2006);
- strengthening the mechanism and development models for policy-oriented agriculture insurance (2008);
- supporting the development of fishery mutual insurance and carrying out a pilot programme on premium subsidy (2012);
- improving the subsidy mechanism for agriculture insurance (2013);
- encouraging the development of various schemes of mutual insurance (2014);
- regulating the management of a catastrophe risk reserve in agriculture insurance (2014); and

⁴ Document No.1 of the central government is the first document released by the central government of China each year. It gives priority attention to the agriculture industry. Since 2004, it has been focusing on agriculture, farmer and rural development.

- setting up a financial support and a distribution mechanism for disaster relief (2014).

The State Council provided guidance as follows:

- Guideline on promoting marine fishery sustainable and healthy development (2013) suggested a study on improving the policy support for fishery insurance and marine aquaculture insurance.
- Guideline on financial support, economic structure modification, transformation and upgrade (2013) urged the promotion of a new type of insurance, such as fishery insurance and its funding support.
- Guideline on marine fishery sustainable development (2013) urged strengthening support for a modern fishery industry system, and the financial agencies to study and implement the fishery insurance support policy and to promote marine culture insurance.
- Guideline on the promotion and development of modern insurance service industry (2014) highlights the importance of agriculture insurance and expansion of fishery and aquaculture insurance and the need to improve the insurance programme for the conventional agriculture and aquatic products.

The Regulation on Agriculture Insurance (1 March 2013) was the first regulation on agriculture insurance in China. Its Article 3 states that government should support the development of diversified forms of agriculture insurance and improvement of the policy-oriented agriculture insurance system. Agriculture insurance organization includes commercial insurance companies and legally established agriculture mutual insurance associations. It defines the responsibilities of various levels of government and the operation, organization and funding for agriculture insurance. Under this provision, the CFMI affiliated to the MOA is recognized as a key institutional infrastructure for fishery and aquaculture mutual insurance programmes.

In 2013, the China Insurance Regulatory Commission provided guidance on further implementation of the regulation on agriculture insurance. It encouraged insurance companies to actively study and develop new insurance schemes such as index-based insurance, and to continually improve and satisfy the increasing demand for insurance. In 2015, the commission promulgated the supervision measures on mutual insurance organizations. Its Article 8 and Article 9 stipulate that agriculture mutual insurance organization should have at least 100 members from the same locality and an operating capital above CNY 1 million.

4.2 Provincial laws and regulations

This section provides information on related laws and regulations promulgated by the local governments of Zhejiang, Guangdong, Jiangsu and Hainan provinces, and the cities of Ningbo, Cixi and Shanghai.

4.2.1 Zhejiang province

In 2012, Zhejiang promulgated the guidance on the use of special fund in its mutual insurance. It provided premium subsidy for mutual insurance of fishing vessel owners' liability and life insurance for fishers. The premium subsidy was 20 percent of the total premium earned for full damage fishing vessel insurance and 20 percent for accident and life insurance of the owners' liability to the workers and individual fisher clients. The fund is under the responsibility of the Zhejiang Provincial Department of Marine and Fishery through the Zhejiang Fishery Mutual Insurance Association.

In 2013, the provincial guidance on promoting the policy-oriented fishery mutual insurance, under the Law of Insurance of China and the Regulation on Agriculture Insurance, supported the policy-oriented fishery mutual insurance programme in the province. As a result, the province increased the budgetary allocation for premium subsidy and extended the insurance services to cover fishing facilities such as anti-wave embankment and landing port, and aquaculture including its facilities. The provision also supports post-disaster relief from typhoons, tidal surge, cold spell, geo-hazard, storm, flood, frost, and epidemics. At least 10 percent of the insurance premium income was reserved for catastrophe relief.

In 2015, the province issued a guidance to encourage cooperation between insurance organizations and commercial banks to carry out agriculture and agriculture-related loan guarantee insurance. Financial

organizations were urged to provide production loan to farmers who have agriculture insurance. The provincial laws not only support the mutual insurance organization with premium subsidy and loans but also grant a favourite tax (i.e. business tax exemption) to agriculture insurance providers.

4.2.2 *Guangdong province*

In 2003, Guangdong released the Regulation on Fishery of Guangdong Province. Its Chapter 4, Article 30 requires a fishing vessel owner to buy life insurance for all workers on board.

In 2004, the province released the guidance on accelerating the development of the marine economy. Article 15 supports the establishment of a policy-oriented fishery mutual insurance.

In 2006, under the Regulation of Fishery Administration of Guangdong Province, Guangdong Bureau of Marine and Fisheries allocated CNY 4 million for premium subsidy to support the pilot mutual insurance programme of the Guangdong Fishing Vessels Owner's Mutual Insurance Association.

In 2007, the province increased the fund to CNY 20 million in support of the pilot programme of a policy-oriented mutual insurance system. It covered the insurance on fisher's life, fishing vessel, and aquaculture. It encouraged exploring the possibility of partnership among the government, mutual insurance organizations and commercial insurance companies in providing insurance.

In 2012, the provincial government approved the work plan for a policy-oriented fishery insurance in Guangdong, collaborating with Guangdong Insurance Regulatory Commission, Guangdong Finance Department and Guangdong Bureau of Marine and Fisheries. The work plan indicated that the insurance premium subsidy shall be 35 percent of total premium or higher, supported by the provincial, city and county governments for fishers and their fishing vessels. CNY 35 million was allocated for subsidy to attract some 150 000 fishers and owners of fishing vessels to the programme.

4.2.3 *Jiangsu province*

In 2009, Jiangsu released the work plan on fishery insurance pilot programme. The target groups were inland and marine fishers and fishing boats. The service providers were the Jiangsu Association of Fishery Mutual Insurance and its local associations. Premium subsidy was provided for mutual insurance premium on full damage of fishing vessels and fishing vessel owners' liability. The subsidy rate was 25 percent of premium paid. It encouraged the local government to provide matching funds for premium subsidy. At the same time, the provincial government provided administration fees (about 23 percent of the total premium income) for the mutual insurance agencies. It also required that the Jiangsu Fishery Mutual Insurance Association share risks with others – not more than 40 percent of total premium income with CFMI, and 5–10 percent with the commercial insurance company for catastrophe risks. The fishery administration departments and its stations in Jiangsu were designated to carry out mutual insurance promotion, risk forecasting and evaluation, technical assessment, and disaster prevention.

In 2011, the Regulation on Fishing Port and Fishing Vessel Management of Jiangsu Province was published. Article 42 requires owners of fishing vessels to purchase insurance for workers on board. It encourages the boat owners to join the mutual insurance for workers on board and insure their boats.

In 2011, the Jiangsu Agriculture Insurance Committee published a notice on Jiangsu Province Policy-Oriented Fishery Insurance. The province's Department of Finance increased the premium subsidy for the policy-oriented fishery mutual insurance. The insured value for owner's liability was raised from CNY 200 000 to CNY 600 000 to meet the demand for higher compensation for loss of life and injury.

In 2014, Jiangsu provincial government published the guidance on promoting modern fishery construction. It strengthens the financial support and insurance facilities for fishery development. Fishery insurance was included in the policy-oriented agriculture insurance category to ensure that the fund for premium subsidy is incorporated in the government's annual budget.

In 2014, the Jiangsu Agriculture Insurance Committee authorized the Jiangsu Fishery Mutual Insurance Association to operate a hydrological index insurance for pond crab culture and freshwater crayfish culture. It included a budgetary item on premium subsidy in the Department of Finance of the province.

4.2.4 *Hainan province*

In 2014, Hainan provincial government published the work plan on agriculture insurance implementation. It amended the policy-oriented fishery mutual insurance by increasing the maximum insured amount to CNY 400 000 for accidental death and injury in marine capture fishery, and increasing the subsidy to 60 percent of premium income for mutual insurance of fishing boats and life of fishers.

4.2.5 *Ningbo municipality*

Fishery mutual insurance has long been established in Ningbo municipality of Zhejiang province. Ningbo was the first city in China that promulgated a regulation to support fishery mutual insurance. The Regulation on Fishery Mutual Insurance of Ningbo Municipality came into force on 1 November 2014. It stimulated a high demand for insurance in the city. The regulation defined the duties of government and related departments, the insurance premium subsidy coverage and ratio, responsibilities and governance of a mutual insurance organization and its participants, claim process and time frame, and the use and inspection of assets.

Participants included enterprises and individuals who paid the membership fee (also counted as premium). The insurance covers boat damage, loss of life, and injury caused by natural disasters and accidents. It also covered epizootics and diseases in aquaculture.

The regulation requires that the fishery mutual insurance programme follow the guiding principles laid down by the government on mutual support, financial subsidy and independent operation. The local fishery administration stations were mandated to promote and service fishery mutual insurance. The fishery mutual insurance association was encouraged to carry out catastrophe relief and devise a mechanism to distribute relief goods.

4.2.6 *Cixi city*

In 2010, Cixi city of Zhejiang province issued the programme on policy-oriented agriculture insurance for white shrimp culture. The Cixi City White Shrimp Association initiated the programme and organized the mutual insurance service for shrimp farmers with support from the local government. The programme insured production loss caused by disease. To improve operational efficiency, four technical assessment teams were formed that consisted of officials and technicians from Cixi Fishery Technical Extension Station and farmer representatives. When shrimp mortality is reported, the loss is assessed by the assessment team. Indemnity is paid at the end of the year. The mutual insurance fund was managed by the association.

4.2.7 *Shanghai municipality*

Started in 1999, Shanghai municipality was the only place in China with a pilot aquaculture insurance. It was in collaboration with Anxin Agriculture Insurance Company. The premium rate was 18 percent for pond and pen culture.

In 2013, the municipal government developed the guidance on implementation of 2013–2015 agriculture insurance subsidy policy. Aquaculture farmers and cooperatives in the municipality were encouraged to participate in a mutual insurance programme, which provided a premium subsidy of 60 percent of total premium. The insured values per mu for finfish, crab and shrimp were set at CNY 2 000, CNY 2 500 and CNY 2 500, respectively. The insurance premium rates were 2 percent, 2 percent and 18 percent, meaning the premium per mu were CNY 40 for finfish, CNY 50 for crab and CNY 450 for shrimp culture.

5. PERILS AND INSURANCE SCHEMES

To reiterate, fishery and aquaculture are deemed high risk sectors. Insured perils in fishery and aquaculture as well as some examples of insurance schemes are described in this section.

5.1 Main perils in capture fishery

5.1.1 Typhoon

The coastal provinces are affected by typhoons every year; usually one or two are highly destructive. The typhoon season is from June to October. Examples of economic losses from Typhoon Fitow in Zhejiang are shown in Table 4.

Table 4. Economic losses caused by Typhoon Fitow in Zhejiang province, 2013

Affected party	District	Economic loss (million CNY)
Members of fishing vessels and owners' liability mutual insurance	Wenzhou	3.2
	Taizhou	1.2
	Zhoushan	2.6
Fishery facilities mutual insurance	Yuhuan anti-wave embankment	150.0
	Yuhuan fishing vessel landing port	0.1
Members of aquaculture mutual insurance	Nanji island	50.0
	Shujiang Dachen island	3.0

Source: Zhejiang Bureau of Marine and Fisheries.

5.1.2 Technical failure and accident

There are reports of accidents caused by failure of engines and other machinery, fire, navigational error, collisions, capsizing of boat, running aground on reefs and rock formations, and other mishaps. Most of the accidents resulted in partial damage. For example, from 2010 to 2014 Zhejiang province alone had 10 478 fishing vessel accidents (Table 5). This caused some CNY 90 million loss per year. Among the types of accidents, collision was the most frequent (64 percent), followed by running aground on rock or reef (13 percent), engine and mechanical failure (9 percent), capsizing (6 percent), fire and explosion (3 percent).

Table 5. Fishing vessel accidents and economic losses in Zhejiang province, 2010–2014

Year	Number of accidents	Economic loss (million CNY)
2010	1 928	60.8
2011	2 238	95.8
2012	1 860	67.9
2013	2 200	90.0
2014	2 252	135.7
Total	10 478	450.2

Source: Zhejiang Bureau of Marine and Fisheries.

In the same period, Zhejiang reported that the number of totally damaged vessels per year was 22–34 boats. The full damage of a vessel requires heavy compensation from the mutual insurance programme. This became the major challenge to sustaining the self-support insurance scheme and meeting the objective of helping fishers recover.

5.1.3 Loss of life and injury on board

Loss of life on board was the most common risk caused by disasters and accidents during fishing operations. This is a serious economic and social concern as labour is the most intensive input in the fishing industry. From 1994 to 2013, CFMI had provided indemnity for more than 9 000 dead (including missing) fishers and to 70 000 injured.

5.2 Insurance schemes in capture fishery

The insurance schemes differ from place to place. The insured value for vessel insurance ranges from 50 to 80 percent of the boat's assessed value, which can be determined by type of hull (i.e. wooden or steel), engine power, and age of vessel for full or partial damage. Following the same basis, the premium can range from 1 to 2 percent of the sum insured.

For example, in Shenzhen, Guangdong province, the mutual provided the fishers with accident insurance. The insurance premium was CNY 1 000 per person for an insured value of CNY 200 000. For boat insurance, the insured value was 60 percent of the boat's assessed value. Premium rates ranged from one to two percent of insured value, i.e. 1 percent for a boat less than 3 years old, 1.2 percent for 4–5 years old, 1.5 percent for 6–10 years old, 1.8 percent for 10–20 years old and 2 percent for more than 20 years old. Premium subsidy was provided by the municipality at 40 percent. The limits of the premium subsidy were CNY 400 for life insurance and CNY 5 000 for boat insurance.

With the Zhejiang Fishery Mutual Insurance Association (ZFMI), the owners of wooden and steel-hulled fishing vessels can apply for a comprehensive insurance programme. The insured value for a steel-hulled vessel was 80 percent and a wooden boat 50 percent of the boat's assessed value. The insured value can be also determined by age and gross tonnage of the fishing vessel, i.e. the insured value of a boat less than 5 years old was CNY 7 000 per ton. For a 6 to 10-year-old boat, it was CNY 6 000 per ton. The insured value for a new vessel was based on its assessed value. In 2015, ZFMI revised the fishery mutual insurance programme for fishing vessel owners' liability insurance. The insured values were increased for death, accident injury, and medical coverages (Table 6).

Table 6. Mutual insurance schemes for fishing vessel owners' liability in Zhejiang province, 2015

Category	Insured value (CNY)		
	Death	Accident	Medical
Marine fishing boat 60 hp	500 000–600 000	200 000–300 000	50 000–100 000
Marine fishing boat < 60 hp	500 000	200 000	30 000
Inland fishing boat	500 000	100 000	20 000

Source: Zhejiang Fishery Mutual Insurance Association.

The fishery mutual insurance schemes in Dongshan city of Fujian province varied from 0.66 percent to 4.0 percent (Table 7). The insured value of a fishing vessel ranged from 60 to 80 percent of the boat's assessed value. Premium subsidy was available for liability insurance and for boat insurance, i.e. 30 percent from provincial government and 10 percent from county government. The owners of fishing vessels only needed to pay 60 percent of the premium for liability and property insurance. There was also demand for a top-up scheme for life insurance and medical insurance in case of injuries on board, both with no premium subsidy.

Table 7. Fishery mutual insurance schemes in Dongshan city of Fujian province, 2015

Category	Insured value (CNY)	Premium rate (% of insured value)	Premium subsidy (% of total premium)	Coverage
Artisanal fishery				
Liability insurance	250 000 (plus CNY 15 000 medical coverage with CNY 400 deductible)	2.2%	Province: 30% County: 10%	
Life insurance	50 000 100 000 150 000	2.5%	No subsidy	
Medical insurance for injuries	35 000–85 000	4.0%	No subsidy	80% of total expense
Vessel insurance	60–80% of boat's assessed value	Steel boat: 0.66% for less than 5 years old; 0.84% for 5–10 years old; 1.0% for >10 years old Wooden boat: 1.0%, 1.11% and 1.23%, respectively	Province: 30% County: 30%	For all types of boats with 60 hp
Distant-water fishery				
Liability insurance	250 000 (plus CNY 15 000 medical coverage with CNY 400 deductible)	2.2%	Province: 30% County: 10%	
Life insurance	250 000–400 000 400 000–600 000 600 000–800 000	2.5% 3.5% 4.0%	No subsidy	
Medical insurance for injuries	35 000–85 000	4.0%	No subsidy	80% of total expense
Vessel insurance	80% of boat's assessed value	Steel boat: 0.66% for less than 5 years old; 0.84% for 5–10 years old; 1.0% for >10 years old Wooden boat: 1.0%, 1.11% and 1.23%, respectively	Province: 30% County: 10%	For licensed boats only; deductible 10% of insured amount

Source: Dongshan Municipal Fishing Vessel Inspection Station of Fujian province.

In Jiangmen, Guangdong province, life insurance and vessel insurance were available with a provision of premium subsidies amounting to 35 percent of the total premium for life insurance and up to CNY 5 000 per boat (Table 8).

Table 8. Fishery mutual insurance schemes in Jiangmen of Guangdong province, 2014

Category	Insured value (CNY)	Premium rate (% of insured value)	Premium subsidy (% of total premium)	Coverage
Life insurance	100 000	Marine: CNY 500 Inland: CNY 400	Provincial: 25% Municipal: 5% County: 5%	For members of mutual insurance
Vessel insurance	60% of boat's assessed value	1.0% for boat less than 3 years old; 1.2% for 4–5 years old; 1.5% for 6–10 years old; 1.8% for 11–20 years old; and 2.0% for more than 20 years old	Provincial subsidy limited to CNY 5 000 per boat	For licensed boat >20 hp

Source: Jiangmen Municipality of Guangdong province.

Insurance is complemented by the social responsibility programme of the mutual. The programme is designed to raise awareness and management of risks to assets, life and production. Services under the programme include weather forecasts, human disease epidemic alerting system, safety measures and equipment. In Zhejiang province,

for example, ZFMI has provided for free about CNY 6 million worth of life saving facilities that included 6 610 sets of life jacket, 554 sets of life buoy, 550 fire extinguishers, and 700 rescue boats. It also helped set up medical service centres near landing areas. ZFMI grants small business loans to members in partnership with the region's commercial banks. It also provides guarantee on the mortgage of a fishing vessel to facilitate loan approval.

Commercial insurance was available for distant-water fishery; it was seen as low risk and vessels generally have good on-board equipment. No cases have been reported on commercial insurance for artisanal fishery and inland fishery. CFMI encouraged commercial insurance companies to also provide reinsurance for fishery insurance mutuals. These companies did: PICC, China Pacific Insurance Company (CPIC), Zking Property & Casualty Insurance Company, China Continent Insurance, and Ping An Insurance (Group) Company of China. The services included catastrophe cover to fishery (Table 9).

Table 9. Commercial fishery insurance in China

Company	Insurance service	Year started
• China Continent Insurance	Owner's liability insurance in Dalian	2007
• PICC and Fujian Fishery Mutual Insurance Association	Vessel and life insurance in Fujian, shared 60:40 between PICC and Fujian association	2008
• PICC • Zking Property & Casualty Insurance	Reinsurance of fishery mutual insurance in Jiangsu for catastrophe cover	2009
• PICC • Ping An Insurance (Group) company of China • China Continent Insurance	Reinsurance in Shandong	2013
• CPIC, Ningbo branch	Reinsurance for catastrophe cover	2015

Source: authors.

5.3 Main perils in aquaculture

The main perils in aquaculture are classified into natural disasters, technical failure, extreme weather, and environmental pollution. Separately or in combination they cause stock mortality and damage to facilities, which are covered by insurance. Some examples of severe events are presented.

5.3.1 Typhoon

Typhoon is a common hazard to the southeastern provinces of China. A number of them make landfall every year inflicting serious damage on mariculture and land-based aquaculture. Guangdong suffers from an average of seven typhoons a year. In 2013, the province was hit by Typhoon Utor causing damages through salination of freshwater bodies, destruction of fish cages, flooding of fish ponds, collapse of pond dykes, and escape of stock. The total economic loss to aquaculture was around CNY 1.3 billion. The affected area was 234 285 mu and 4 278 cages were destroyed (Table 10).

Table 10. Damages caused by Typhoon Utor in Guangdong province, 2013

City	Area affected (mu)	No. of cages destroyed	Economic loss (million CNY)
Maoming	62 817	1 440	274
Yangjiang	57 915	852	411
Jieyang	21 500	987	91
Shaguan	11 862	654	31
Shantou	80 191	345	478
Total	234 285	4 278	1 285

Source: Guangdong Bureau of Marine and Fisheries.

Also in 2013, Typhoon Fitow destroyed an aquaculture area of 800 000 mu in Zhejiang and Fujian provinces. It caused a direct economic loss of CNY 3.4 billion that strained the mutual insurance programmes of Zhejiang and Fujian; total indemnity paid was CNY 14 million and loss ratio was 700 percent.

5.3.2 *Flood*

Flooding is usually triggered by storms and typhoons and inflicts damage on pond aquaculture. In 2011, Guangdong suffered a severe flood that affected 739 000 mu of aquaculture area and destroyed 92 000 tonnes of farmed fish and 860 million pieces of seed and fingerling. The economic loss was CNY 925 million.

5.3.3 *Red tide*

Red tide can cause large mortality to aquatic animals farmed in coastal area. They also lower the value of molluscs or render the harvest unmarketable because of the toxin. In 2011, red tide occurred in the sea farming area of Zhuhai city of Guangdong. The loss to local companies and aquaculture farmers was CNY 3 million.

5.3.4 *Low temperature and frost*

Low temperature and frost are extreme climate events in subtropical southern China. In 2008, abnormally low temperatures in Guangdong, Guangxi and Hainan provinces seriously affected a wide aquaculture area with snow and a long-lasting cold weather. Some 256 000 mu of aquaculture ponds were affected by low temperature with a production loss of 41 000 tonnes and 120 million seeds and fingerlings. Total loss was CNY 343 million.

In 2013, Guangxi was affected by low temperature and frost with a disaster area of 9 020 mu, production loss of 436 tonnes and 2.6 million fingerlings, all worth CNY 5.4 million.

5.3.5 *Technical failure and diseases*

Aquaculture production can be disrupted by technical failure at any stage of the process resulting in poor growth or mortality. Taking shrimp culture as an example, the culture process has complex technical requirements from hatchery to nursery to grow-out, feeding, disease control, water quality control and routine management. In 2013, 130 000 mu of white shrimp farms in Zhongshan city of Guangdong suffered from a disease outbreak, causing an 80 percent loss of production. Diagnosis failed to identify the cause of the disease.

5.3.6 *Seawater pollution*

Pollution of coastal waters where aquaculture operations are established can come from harmful materials and other pollutants from land-based sources or from ships. In 2014, there was a 100-km² swathe of eutrophication caused by inorganic nitrogen fertilizer and phosphate. The same year saw 15 occurrences of harmful algal bloom, mainly red tide.

5.3.7 *Freshwater pollution*

Freshwater pollution is usually caused by flood and runoff from agricultural lands contaminated with pesticides. Another source is waste water discharge from industries, households and river transport. If the contaminated water is taken into the pond or flows into a cage culture area, it would cause stock loss from eutrophication, poisoning and disease.

For example, in 2010, flooding caused river contamination by a bronze mining company, resulting in the mortality of fish being raised in cages. The direct economic loss was around CNY 31.9 million. In 2013, a diesel oil tanker rolled over at Yudai river in Shaanxi province, spilling 2 tonnes of diesel oil into the river.

5.4 **Insurance system and schemes in aquaculture**

Since 2012 aquaculture insurance has been piloted under the policy-oriented programme in eight provinces, namely, Beijing, Shanghai, Chongqing, Anhui, Jiangsu, Fujian, Guangxi and Jilin. The two types of aquaculture insurance – indemnity-based and index-based – are used in mutual insurance and commercial insurance.

5.4.1 *Indemnity-based insurance*

Indemnity insurance is a traditional insurance scheme, which can cover stock mortality or production loss caused by windstorm, rainstorm, tropical storm, severe tropical storm, typhoon, tornado, flooding, thunder, continuing low temperature and frost, and escape when pond dykes collapse or pond water overflows. In some cases, the mortality caused by diseases was included. Damage to cage facilities in inland open water and sea water was also included in the pilot insurance programme. Claim process is costly and time consuming because loss adjustment is needed before the compensation can be paid to the individual farms.

CFMI and its local mutual insurance associations initiated the aquaculture mutual insurance programmes in 2012. The programmes have been piloted in Fujian, Anhui, Sichuan, Shandong, Zhejiang and Jiangsu provinces for the main species grown in each pilot area. The schemes and premium subsidies vary by provinces, usually depending on the financial capacity of the local government.

For example, CFMI and Shandong Provincial Association of Fishery Mutual Insurance carried out an inland aquaculture insurance programme that covered the commonly cultured species of common carp, crucian carp, grass carp, silver carp, bighead carp and blunt snout bream. It covered production loss caused by natural disasters (rainstorm, hail, windstorm, drought and thunder) and fish diseases that included septicaemia caused by bacteria, echinococcosis, gyrodactylus, hemorrhagic disease, red skin, gill rot and enteritis.

Fujian Fishery Mutual Insurance Association piloted laver culture insurance in Fujian, insuring against production loss from typhoon, high temperature and diseases. It received a premium of CNY 230 000. The government provided a premium subsidy of 30 percent. The insured area was 1 108 mu in total.

In Luzhou of Sichuan province, the aquaculture mutual insurance covered the major freshwater aquaculture species, i.e. grass carp, common carp, crucian carp, silver carp, bighead carp, large-mouth catfish and channel catfish. The production cost norm rather than the production value was used as a basis for the calculation of sum insured with a premium rate of 8 percent for all species. The sum insured was CNY 2 500 per mu with a premium rate of CNY 200 per mu. The government provided a premium subsidy of 70 percent.

In Ningbo municipality, the programme was provided to white shrimp culture. The insured value was CNY 5 000 per mu at a premium rate of 8 percent. The insured farmers received a premium subsidy of 32.5 percent from Ningbo municipality and 32.5 percent from the county government. The farmers paid 35 percent.

Guangxi started the insurance pilot programmes for shrimp and oyster farming in 2015. Indemnity-based insurance was applied for shrimp, wind-index insurance for oyster. For shrimp, the insured value was CNY 2 000 per mu and the premium rate was CNY 180 per mu (9 percent). The major coverages were mortality and production loss caused by disease.

In 2015, Hefei in Anhui province implemented a freshwater aquaculture insurance programme, targeting farms with culture area of more than 50 mu. The sum insured was CNY 2 000 per mu and premium was CNY 160 per mu (8 percent). The insurance covers production loss caused by drought, frost, water pollution, poison and disease. The programme received a premium subsidy of 30 percent from the municipality and 40 percent from the county.

In 2015, Fujian Fishery Mutual Insurance Association carried out a mutual insurance programme with aquaculture cooperatives. The insured value was set at CNY 5 000 per mu for white shrimp, CNY 4 000 per mu for cyprinid fish (*Spinibarbus* spp.), CNY 3 000 per mu for common carp, and CNY 600 per mu for rice-fish farming. These were set on a production cost basis. The premium rate was 5 percent of insured value and coverage was one year. The programme received premium subsidies from provincial and county governments at 40 percent and 30 percent, respectively. There was no claim filed in 2015.

5.4.2 *Index-based insurance*

To simplify the claim process and reduce moral hazard, which are the typical challenges of indemnity insurance, index-based insurance was developed for agricultural insurance. Generally, index (or parametric) insurance is

based on the local administration record of certain parameter that is specified in the insurance contract. When extreme weather condition occurs, the agreed compensation will be paid to the insured without a need for loss assessment at farm level. In China, however, during the pilot programme a certain level of production loss was set as an additional condition for assessing the compensation. This may be seen as part of the trials aimed at collecting information on the correlation between the degree or intensity of the parameter used and the level of loss in a particular pilot area. This would help reduce ‘basis risk’, which is a potential problem in index insurance when, sometimes, the payout is triggered without a real physical loss or otherwise (i.e. no payout for a clear damage or loss). The main index-based insurance being piloted in China are hydrological, wind speed and temperature index insurance.

Wind-index insurance was designed based on the relationship of wind and degree of damage; if the wind scale exceeds the contracted index record, compensation is paid. For example, in 2014, Rongcheng in Shandong province piloted the wind-index insurance for seaweed culture (the insured species were *Laminaria japonica*, *Undaria pinnatifida* and *Gracilaria lemaneiformis*). It set the windstorm speed of more than 8 degrees (62–74 km/hr) for compensation (see Appendix 3 for the wind scale in degree and the equivalent speed in meter per second or kilometre per hour). The sum insured was CNY 2 000 per mu. The premium rate was 5 percent or CNY 100 per mu. The compensation values were set for the following scales: 1.25 percent of insured value for 9 degrees (75–88 km/hr), 2.25 percent for 10 degrees (89–102 km/hr), 10 percent for 14 degrees (150–166 km/hr), and 40 percent for 17 degrees (202–220 km/hr). The programme received a 50 percent premium subsidy from the local government. Four seaweed farming cooperatives were insured for a total of 160 000 mu with premium of CNY 16 million and an insured value of CNY 320 million. Four claims were filed. The compensation was around CNY 8 million and the loss ratio was 50 percent.

In 2015, Qinzhou in Guangxi province started the wind-index insurance for oyster (*Crassostrea ariakensis*). PICC and Guangxi Bureau of Animal Husbandry and Fisheries jointly operated the insurance programme, which provided coverage against storm. Compensation was paid at the wind speed of 10 degrees or stronger. The insured amount was CNY 9 000 per mu. The insurance policy provided for a one-year coverage with 7 percent of premium rate. Farmers paid 30 percent of the premium (CNY 189 per mu) and the government subsidized 70 percent of the premium (CNY 441 per mu). Compensation were set at 5 percent of sum insured for 10 degrees (89–102 km/hr) and 100 percent for 17 degrees (202–220 km/hr) or more, with a maximum limit of CNY 9 000 per mu. The farm production cost was around CNY 30 000–40 000 per mu. The insurance maximum coverage was thus around 30 percent of the production cost.

Cultured sea cucumber and freshwater crab are sensitive to temperature changes. Temperature-index insurance was developed for sea cucumber in Dalian in Liaoning province and freshwater crab farming in Jiangsu. Dalian piloted the scheme in 2015. The premium rate was 6.5 percent, with an insured value of CNY 2 000 per mu. Premium paid was CNY 130 per mu.

CPIC initiated a temperature-index insurance for mitten crab (*Eriocheir sinensis*) in Wujiang city, Suzhou municipality of Jiangsu province. The insurance covered high temperature risk in pen culture in Lake Taihu. Payout was triggered when air temperature was higher than 37.5 °C for more than three consecutive days. The premium was CNY 110 per mu. The indemnity was CNY 50 per mu for each high temperature day, with a maximum limit of CNY 1 000 per mu. In 2013, there were 11 days of high temperature records of 38 °C. The farmers received an indemnity of CNY 550 per mu (CNY 50 per mu multiplied by 11 days). It was reported that the event caused a 20–30 percent production loss. In this case, around 5–7 percent of the insured farmers’ income loss was compensated.

5.4.3 Commercial insurance and reinsurance

Commercial insurance companies have well established insurance systems and offices located nationwide. They have a strong financial capacity, well-established regulations and procedures, and lengthy experience in servicing insurance buyers. They also render consulting services. The government encouraged commercial insurance companies to provide aquaculture insurance.

There were eight companies that joined the insurance pilot programme for aquaculture (Table 11). All commercial insurance pilots are carried out under the policy-oriented insurance programme with support from government such as premium subsidy and favourite tax.

Table 11. Insurance companies that participated in the aquaculture insurance pilot programme

Company	Region	Commodity	Insurance type	Year
PICC	Jiangsu	Freshwater finfish	Indemnity	2013
PICC	Dalian of Liaoning	Marine ranching	Wind index	2013
PICC	Guangdong	White shrimp	Indemnity	2013
Anxin Agricultural Insurance	Shanghai	Finfish and white shrimp	Indemnity	2013
PICC	Anhui	Finfish	Indemnity	2013
PICC	Rongcheng in Weihai city of Shandong	Seaweeds	Wind index	2014
PICC	Hubei	Freshwater crayfish	Indemnity	2014
Anhua Agricultural Insurance	Jilin	Pond finfish farming	Indemnity	2014
Sunlight Agricultural Mutual Insurance	Guangdong	White shrimp	Indemnity	2014
Guoyuan Agriculture Insurance	Anhui	Finfish	Indemnity	2014
Groupama Avic Insurance	Sichuan	Carps and sturgeon	Indemnity	2014
Pacific Property Insurance	Hainan	Sea cage culture	Wind index	2014
China United Property Insurance	Jiangsu	White shrimp	Indemnity	2015
PICC	Dalian of Liaoning	Puffer fish (indoor system)	Indemnity	2015
Pacific Property Insurance	Ningbo	White shrimp	Typhoon index	2015
Pacific Property Insurance	Suzhou	Freshwater mitten crab	Temperature index	2015
PICC Guangxi	Qinzhou	Oyster	Wind index	2015
Pacific Property Insurance	Dalian	Sea cucumber	Temperature index	2015

Source: authors.

In 2013, the PICC branch in Guangdong province started to insure white shrimp aquaculture against storm, strong wind, typhoon, flood, continuing low temperature that causes mortality, and escapes from bank collapse, flooding, and some diseases (named perils). The sum insured value was CNY 20 000 per mu at a premium rate of CNY 1 260 per mu (6.3 percent). Indemnity was paid when there was at least a 20 percent production loss caused by the insured perils, except diseases. For production loss caused by diseases, the deductible amount that retained by the insured was at least a 30 percent production loss.

In 2014, PICC insured 43 000 mu of freshwater crayfish farms in Qianjiang city of Hubei province. The sum insured was CNY 800 per mu and the premium was CNY 40 per mu (5 percent). The programme received premium subsidy from Qianjiang city of 50 percent, which means the total premium subsidy earned was CNY 860 000.

Private insurance companies also provide insurance services to cooperatives. The cooperative has become the major organization in aquaculture production in China. The number is increasing. The cooperatives are organized by local farmers raising the same species. They usually have similar technical background, share information and experiences, and collectively procure their seed and feed supplies, market their products, and adopt risk management practices and technologies. It has proved to be a successful organizational form in modern aquaculture development in China.

Commercial insurance with cooperatives has several advantages: (i) the insurance organization enters into a contract with the cooperative which in turn contracts its members; (ii) the cooperative usually has experienced members who can help in the technical assessment of risks; (iii) the members are farming the same species and can easily share information and technology to improve farm management and capability for risk management; and (iv) the insurance company could provide a bonus for risk management to cooperatives as an incentive for farmers to join the insurance programme. Section 7 presents the case when Anxin Agriculture Insurance Company contracted shrimp insurance with cooperatives in Shanghai. It was well organized and provides an example of a successful case.

Private companies are encouraged to provide reinsurance. Chinese companies such as PICC and CPIC and international reinsurers such as Swiss Re have joined the aquaculture insurance programme.

6. STATUS OF INSURANCE PROGRAMMES

6.1 Fishery insurance programme

Fishery insurance in China developed rapidly after 2007 under the policy-oriented programme, with premium subsidies mainly from provincial and county governments. The premium earned by CFMI increased significantly every year after 2007 (Figure 3); that was when life insurance for fishers provided a higher premium income than that from vessel insurance.

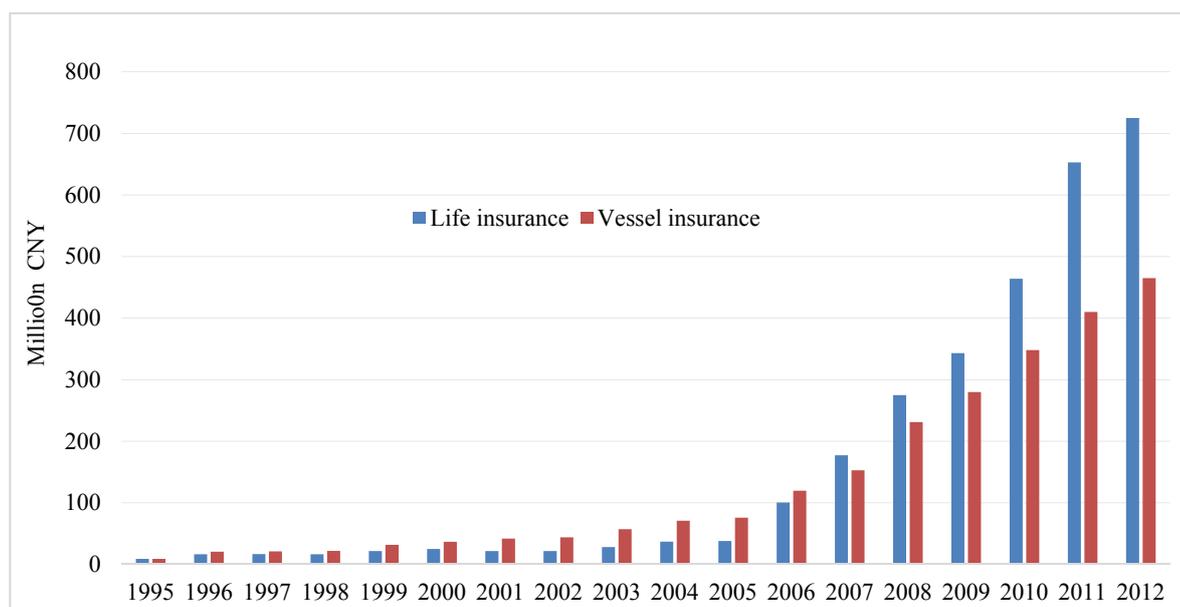


Figure 3. CFMI's premium income from fishery insurance, 1995–2012

Fishery mutual insurance occupied about 95 percent of the total fishery insurance business in China. In 2012, CFMI provided insurance to 69 722 fishing vessels (7 percent of all fishing boats) and 929 414 fishing workers (52 percent of all fishing workers). The total sum insured was CNY 204 billion with a premium income of around CNY 12 billion. The total indemnity paid was around CNY 3.8 billion for 14 213 claims, of which 57 percent was for injuries and death and 43 percent for vessel damage. The loss ratio was 32 percent, indicating a good business performance as the total indemnity paid was only one-third of the premium earned. Insurance claims on serious cases in 2014 that caused serious damages are summarized in Table 12.

Table 12. Indemnities paid by CFMI for cases of major claims, 2014

Date	Case	Description	Indemnity paid (million CNY)
7 February	Fire on Zhelingsyuleng 90058	6 died, 1 seriously injured	3.8
5 March	Fire on Xinjili 8	Fire in the cabin	2.6
15 May	Engine failure of Zhouhongyuan 1	Out of control and had to be repaired	2.6
14 July	Fire on Fuyuanyu 876	Fire on the top deck	2.2
18 July	Typhoon Rammasun	Vessels damaged or sunk in Hainan, Guangdong and Guangxi	2.1
31 July	Fire on Dongyu 1509	Fire in the cabin	2.0
16 September	Typhoon Seagull	Vessels damaged or sunk in Hainan and Guangdong	3.3
27 October	Sinking of Fuyuanyu 680	High waves capsized the boat, 8 crew members lost, 3 rescued	4.0

Source: CFMI website at www.cfmi.org.cn

Insurance provision under the policy-oriented programme attracts the participation of more fishers and vessel owners. However, CFMI reported that the participation in fishery mutual insurance is not big enough. The reasons for low participation were low fishers' awareness of risk management and low compensation paid compared to the total loss value. In addition, the budget for premium subsidy is not secure as it is not included in the central government budget.

6.2 Aquaculture insurance programme

Aquaculture insurance was started in 1999 in Shanghai. It relied heavily on government support. It covered less than 1 percent of the total aquaculture area. Although aquaculture in China has developed rapidly, it is considered a high-risk business with a high technical requirement. This poses difficulties in the evaluation of production loss and identification of risks in aquaculture practices. Farmers have been devising their own risk management measures and paid little attention to insurance for risk management. They would attribute a disaster to 'bad luck'. There were moral hazard issues: some farmers provided fake stocking records or submitted inflated loss quantity. In other cases, when no disaster happened, the farmers thought the insurance premium should have been refunded.

According to the China Insurance Regulation Commission, the top five provinces/cities ranked by their premium income from aquaculture insurance were Shanghai, Jiangsu, Sichuan, Dalian of Liaoning, and Anhui; in 2013, they earned premiums of CNY 61, 31, 25, 18 and 3 million, respectively, from inland freshwater aquaculture, except Dalian, which was from mariculture insurance.

Due to high loss ratios, some of the pilot cases were considered unsuccessful. The loss ratio in freshwater aquaculture insurance, however, has significantly decreased while that in mariculture remains uncertain, indicating a high risk for the insurer (Table 13).

Table 13. Loss ratios of aquaculture insurance in China, 2007–2013

Year	Loss ratio by culture environment (percent)	
	Freshwater	Marine
2007	95	0
2008	75	1 557
2009	99	n.a.
2010	84	n.a.
2011	66	16
2012	63	2 120
2013	50	81

Note: n.a. = data not available.

Source: China Insurance Regulatory Commission.

Anxin Agriculture Insurance Company piloted an aquaculture insurance programme in Shanghai. From 2006 to 2009, the programme was granted 40 percent premium subsidy, and the loss ratio ranged from 80 to 300 percent. From 2012 the company sought technical support from Shanghai Fishery Technical Extension and Fishery Administration Centre. The experts provided technical guidance to shrimp farmers and assistance on production loss assessment. Government subsidy was increased to 60 percent and loss ratio went down to less than 60 percent.

In Chengdu, Sichuan province, aquaculture insurance was piloted by Groupama Avic Company in 2010. The insurance was given technical support by the Chengdu Fishery Bureau. With the encouragement of the local officers and a subsidy programme (77 percent premium subsidy from the local government), the premium income increased from CNY 1.6 million in 2010 to CNY 16.5 million in 2012. It accounted for 10 percent of the total premium income of the Groupama Avic Company. Sixty percent of the fish farmers in Chengdu participated in the programme. Loss ratio was 55 percent. Insured perils included specific diseases, natural disaster, mortality from low oxygen level, and accident. The programme provided that if the loss ratio was 150–250 percent, the Chengdu Municipality bore 50 percent; but if it exceeded 250 percent, it would bear the entire indemnity.

In 2014, Sunlight Agricultural Mutual Insurance Company provided insurance for white shrimp culture in Guangdong province. The sum insured was set at CNY 20 000 per mu, with a premium rate of 6.3 percent

(CNY 1 260 per mu). Twelve farmers joined the policy-oriented insurance programme. The total premium earned was around CNY 300 000 and the indemnity paid was around CNY 500 000. Loss ratio was 167 percent.

In 2015, some 5 200 mu of farmed sea oysters were insured under the policy-oriented insurance programme. The total premium income was CNY 3.3 million. In October, Typhoon Mujigae hit Guangxi and 1 480 mu of the oyster culture area was declared as affected area. Indemnity paid was CNY 558 500. Loss ratio was 17 percent.

7. PERFORMANCE OF THE INSURANCE PROGRAMME

This section provides information on the insurance programme and its performance based on some pilot areas. This includes the cases of marine and inland capture fishery insurance, and crab, seaweed, finfish and white shrimp aquaculture insurance.

7.1 Marine fishery mutual insurance

The fishery industry of Zhejiang province contributes 25 percent to the province's total agricultural production value. Zhejiang Fishery Mutual Insurance Association was established in 2004 to provide insurance to fishing vessels and life insurance to fishers. In 2012, the Department of Finance of Zhejiang published a guidance on the use of a special fund in the policy-oriented programme of fishery mutual insurance. It mandates the provincial government to provide 20 percent premium subsidy to fishing vessel insurance and life insurance. Zhejiang Bureau of Marine and Fisheries was authorized to implement the subsidy programme.

The premium subsidy programme actually began in 2009. From 2009 to 2013, the amount provided for subsidy to fishery mutual insurance was CNY 334 million. It served 617 587 fishers and 67 999 fishing vessels, with a total insured value of CNY 280 billion. The ZFMI settled 27 713 claims and paid an indemnity of CNY 617 million during that period.

The scheme required the members to enter into a contract with the mutual insurance organization and pay the premium. The responsibility of the mutual was to provide compensation for property loss caused by natural disasters and accidents, death and injury from accidents and illness during fishing.

The mutual insurance in Ningbo municipality of Zhejiang provides services to enterprises (boat owners' liability) and individual fishers. The premium rate for liability insurance was 0.45 percent, with an insured value for loss of life of CNY 500 000, accident injury of CNY 300 000 and additional medical insurance of CNY 50 000. The premium rate for fishing vessel insurance was 0.25 percent. The mutual received a premium subsidy of 20 percent from Ningbo municipal government and 50 percent from the county government. Data in 2013 and 2014 indicate good performance; the total premium income of Ningbo's mutual was significantly higher than the indemnity paid, resulting in low loss ratios (Table 14).

Table 14. Fishery mutual insurance performance in Ningbo of Zhejiang province, 2013–2014

Year	No. of insured vessels	No. of insured fishers	Premium income (million CNY)	Indemnity paid (million CNY)	Loss ratio (%)
2013	5 861	23 600	58.4	31.6	54
2014	5 574	23 053	70.7	34.3	48

Source: Ningbo Fishery Mutual Insurance Association.

The results from Jiaojiang and Yuhuan of Zhejiang also turned out good. The premium rate of vessel insurance was 1.3 percent, higher than that in Ningbo. In 2015, the loss ratios were very low in both counties (Table 15).

Table 15. Fishery mutual insurance performance in Jiaojiang and Yuhuan of Zhejiang province, 2015

County	Insurance type	No. of insured	Premium income (million CNY)	Premium rate (%)	No. of claims settled	Indemnity paid (million CNY)	Loss ratio (%)
Jiaojiang	Vessel	741	6.5	1.3	101	2.4	37
	Life	6 529	14.8	0.5	70	1.9	13
Yuhuan	Vessel	485	5.5	1.3	130	1.6	29
	Life	4 119	11.7	0.5	108	5.8	49

Source: Zhejiang Fishery Mutual Insurance Association.

7.2 Inland fishery mutual insurance

Inland fishing is an important part of Jiangsu's fishery industry. There are around 80 000 vessels and 300 000 fishers engaged in the province's inland fishery. Jiangsu Fishery Mutual Insurance Association was established in 2008. It was affiliated with Jiangsu Bureau of Marine and Fisheries and certified by the Jiangsu Department of Civil Affairs. It is a non-profit organization and consists of voluntary organizations in fishery production and service, individual farmers and fishers, aiming to provide mutual support to members. In 2014, the association insured 4 707 vessels and 66 558 fishers. The total sum insured reached CNY 23.2 billion and the premium income was CNY 100.1 million. The provincial government provided CNY 33.2 million in premium subsidy.

Fishery insurance programme had strong policy support from the province. In 2011, Jiangsu's agriculture insurance committee issued a guideline on policy-oriented fishery insurance. In 2012, Jiangsu's finance committee suggested the inclusion of life mutual insurance provision for inland fishers in the programme. The programme thus provided fishing vessel insurance, vessels' owner liability insurance, and life insurance.

Life insurance covered death or injury caused by accidents during fishing operation. Coverage period was one year. The insured value varied from CNY 10 000 to CNY 120 000. The participants were inland fishers and workers in fishery services not older than 70 years. The premium rates were from 0.25 to 0.35 percent, depending on the insured value chosen by the insured and the fishing zone (Table 16). The local government gave 25 percent premium subsidy and fishers paid 75 percent of the premium.

Table 16. Premium rates of life insurance for inland fishers in Jiangsu province (2011 scheme)

Insured value (CNY)	10 000		20 000 or above	
	C	B	C	B
Premium rate (%)	0.30	0.35	0.25	0.30

Note: Navigation zone B is the river section in Yangtze river from Jiangyin to Yichang. Zone C is above Yichang.

Jiangsu Fishery Mutual Insurance Association transferred part of the risks, that is, about 40 percent of premium income with CFMI, and 5–10 percent for catastrophe risks with Zking Property & Casualty Insurance and PICC in Jiangsu.

The record of life insurance in Changzhou municipality of Jiangsu province showed a good performing programme, indicated by very low loss ratios ranging of 4 to 36 percent (Table 17).

Table 17. Performance of the life insurance programme for inland fishery in Changzhou municipality of Jiangsu province, 2010–2015

Year	No. of insured	Insured value (million CNY)	Premium income (thousand CNY)	Indemnity paid (thousand CNY)	Loss ratio (%)
2010	6 019	220	551	66	12
2011	6 319	299	743	78	11
2012	5 882	447	1 024	96	9
2013	5 694	645	1 474	59	4
2014	4 309	465	1 100	276	25
2015	3 223	348	823	294	36

Source: Changzhou Fishery Administration Station.

7.3 Crab farming insurance

Mitten crab (*Eriocheir sinensis*) farming is an important industry in Jiangsu province. Jiangsu Bureau of Marine and Fisheries reported that in 2014 the crab culture area was 3.7 million mu with a production of 370 000 tonnes valued at CNY 28 billion. This was 5.8 percent of the total fishery production and 19 percent of the fishery production value in Jiangsu province.

The index-based insurance for crab farming was promoted by Jiangsu Fishery Mutual Insurance Association. Insurance was provided to farms of more than 20 mu in area. The insured perils were rainstorm, drought and high temperature.

- For rainstorm, the indemnity is paid when all these conditions are met: (i) the water level in nearby ponds, rivers or lakes rises above the critical warning line; (ii) the pond water level is 130 percent above the seasonal standard water level, i.e. 0.5–0.8 m in spring and 1.0–1.5 m in summer; and (iii) water in the culture pond cannot be discharged totally within 48 hours.
- For drought, the payout is triggered by the following conditions: (i) the water level in nearby ponds, rivers and lakes is below a critical warning line; (ii) pond water is 70 percent lower than the seasonal standard water level; and (iii) ponds cannot be refilled with water within seven days.
- For high temperature, indemnity is paid when temperature recorded is above 37 °C for seven consecutive days.

In 2013, Changshu city published a guidance on promoting agriculture insurance that included crab insurance. The programme provided 25 percent of the premium subsidy from the city government and another 25 percent from the township government. Insured farmers paid 50 percent of the premium.

In 2013, there were 33 insured cooperatives in Jiangsu. The total insured area was 18 258 mu with insured value of CNY 11 million. The total premium income was CNY 669 000 (6 percent premium rate). There were 31 claims, which were paid a total indemnity of CNY 318 500. Loss ratio was 48 percent.

In 2014, around 280 000 mu were insured in Huai'an city of Jiangsu. The total sum insured was CNY 560 million, with premium income of CNY 30.8 million (5.5 percent premium rate). The government provided a premium subsidy of 60 percent and farmers paid 40 percent of the premium.

However, some insured farmers thought that the insurance scheme did not fit their needs. For example, the compensation would be paid to farmers when there were seven consecutive days of high temperature above 37 °C, but in the historical record this happened only once in the past 60 years. Some farmers said they have the capability to deal with the impacts from rainstorm and drought and would need coverage for other risks, particularly disease and price risks. It was mentioned that the compensation received was too low. The production cost of intensive crab farming is around CNY 4 000 per mu, which is ten times higher than the insured value for high temperature.

7.4 Seaweed culture insurance

Seaweed culture in China has helped improve the livelihoods of coastal communities. Two major seaweed species being farmed are *Porphyra yezoensis* and *Porphyra haitanensis*. In 2014, the annual production of laver was 114 200 tonnes from a culture area of almost one million mu. The major production regions are Jiangsu and Fujian provinces. The main hazards are strong wind, storm, disease and frost. In recent years, the major risks to laver culture have been strong wind and disease, i.e. rotting of the fronds induced by high temperature.

In 2015, an insurance programme was piloted in Qidong county of Jiangsu by Jiangsu Bureau of Marine and Ocean in collaboration with Huanong Property Insurance Company, Laver Culture Association, and Qidong Bureau of Marine and Fisheries. The insured culture area was 5 000 mu. Premium subsidy of up to 80 percent was provided. The programme insured against production loss caused by rainstorm, strong wind, storm, frost, fog and disease, and damage to facilities caused by rainstorm and strong wind. The insured period is eight months from September to April of each crop year. The indemnity is paid when production loss was more than 20 percent and damage to facilities was more than 30 percent. A crop loss of 85 percent or more is considered total loss. The insured value was CNY 800 per mu for crop, with a premium rate of 8 percent, and CNY 2 000 per mu for facilities such as raft, net and rope including cost coverages for seed and diesel oil, with a premium rate of 6 percent. The compensation rates are based on the culture stages, i.e. 60 percent of the insured value during the seedling period, and 100 percent during the grow-out period. The deductible amount is 25 percent for the first crop and 20 percent for the succeeding crops. There was no record of claim settlement.

In 2013, Zhejiang Fishery Mutual Insurance Association piloted the insurance programme for laver culture. It insured against production loss caused by strong wind and high temperature. The records from the meteorology station and the marine surveillance station were used as references. If the wind speed was more than 11 degrees (103–117 km/hr) and causes production loss of more than 30 percent, compensation was paid. For high temperature, indemnity was paid when the water surface temperature reached at least 29 °C for 15 consecutive days and caused 30 percent production loss (i.e. thallus is rotted). Farmers were required to report any insured perils that occurred to the local mutual association within 24 hours so that damage assessment could be carried out by a technical team assigned by the association for claim settlement. The rates of indemnity paid vary with the extent of damages to the insured facilities (net and raft) and/or crop (Table 18). If all facilities and the crop were damaged, the compensation was 100 percent of the assessed damage cost. The insured values for crop loss were CNY 3 000 per mu for bamboo and fiberglass poles model and CNY 6 000 for floating raft model. The premium rates were 4.8 percent of insured value for the bamboo and fiberglass poles model and 6.0 percent for the floating raft model.

Table 18. Rates of indemnity paid to seaweed insurance in Zhejiang province, 2013

Culture period	Type of damage	Indemnity paid (% of assessed damage value)
Whole culture period	Raft damaged	20
Seeding	Net damaged	35
Growing period	Net damaged	75
Growing period	Net, raft and laver damaged	100
Whole culture period	Only laver damaged	0

Note: Deductible amount of 20 percent of insured value is applied.

Source: Zhejiang Fishery Mutual Insurance Association.

The provincial government provided premium subsidy of 30 percent, the local government 10 percent. As in Qidong County, the compensation can cover part of production cost.

7.5 Freshwater finfish culture insurance

Over its long history of freshwater aquaculture, China has developed many species for culture under numerous culture systems. Finfish is the most important aquaculture commodity in China. In 2014, the total freshwater aquaculture production was around 29 million tonnes from a total pond area of 90 million mu. It was valued at CNY 507 billion.

The hazards to freshwater finfish aquaculture are diseases, flood, storm, typhoon, water pollution and extreme weather. Anhui, Hubei and Jilin provinces developed mutual insurance for finfish aquaculture jointly with a commercial insurance company. This is called ‘mutual plus commercial’ model. The scheme provided compensation to production loss caused by rainstorm, windstorm, drought, frost, water pollution, poisoning of fish, and diseases.

In Anhui province, the pilot insurance was jointly operated with Guoyuan Commercial Insurance Company. The insurance scheme was guided by the local government and organized by the Anhui Bureau of Fisheries. In 2014, the pilot programme was implemented in 28 counties. In 2015, it covered 31 counties and the number of farmers/cooperatives that participated and the culture area insured rose significantly (Table 19). This increased premium income. The premium rate was 7 percent of the insured value, with the insured value of CNY 2 000 per mu. The government subsidized 70 percent of the premium – 30 percent coming from the municipality and 40 percent from the county.

Table 19. Performance of mutual insurance pilot for freshwater aquaculture in Anhui province, 2014–2015

Year	No. of insured	No. of area (mu)	Sum insured (million CNY)	Premium earned (million CNY)	Indemnity paid (thousand CNY)
2014	628	180 000	360	24.6	107
2015	1 032	270 600	540	37.9	165

Source: Anhui Bureau of Fisheries.

In Sichuan province, the insurance programme has been operated by Groupama Avic Insurance Company since 2010. To participate in the programme, a farmer must have a license or be a member of a cooperative. The fish species insured are grass carp, silver carp, common carp, crucian carp and yellow catfish. It insured against production loss caused by disaster, accident, water pollution (announced by the fishery administration station), disease, and low oxygen level.

Natural disasters covered are rainstorm, flood, windstorm, hail storm, thunder, earthquake, drought, frost, landslide and mud-rock flow. Accidents covered are fire, explosion, building collapse, and anything that falls from the sky.

A wide range of diseases is covered. These include spring viraemia of carp (SVC), white spot syndrome in shrimp, grass carp hemorrhage virus (GCHV), infectious renal necrosis, koi herpes virus disease, cryptocaryoniasis, freshwater fish bacterial septicaemia, viral nervous necrosis (VNN), epizootic haematopoietic necrosis, channel catfish virus disease (CCVD), infectious hematopoietic necrosis (IHN), viral hemorrhagic septicaemia (VHS), epizootic ulcerative syndrome, ichthyophthiriasis, myxosporidiasis, gyrodactyliasis, dactylogyriasis, streptococciosis, bacterial gill rot, bacterial enteritis, and other epizootics.

Indemnity is paid under the following conditions: 15 percent production loss for culture pond of less than 5 mu, 10 percent for 5–10 mu or bigger pond or production loss of 500 kg or higher. The insured value was CNY 12 000 per mu (based on the average production of 1 500 kg per mu multiplied by the average production cost of CNY 8 per kg). Premium rate was 5 percent or CNY 600 per mu. The deductible was 20 percent of sum insured.

In 2012, the Sichuan provincial government laid down the rules in supporting the participating insurance company, as follows. If the loss ratio is less than 150 percent, the indemnity will be fully paid by the company. If the loss ratio is in the range of 150–250 percent, government will support 50 percent of the indemnity paid. If it is more than 250 percent, the compensation is borne entirely by the government.

In 2012, Groupama Avic Insurance provided aquaculture insurance in Sichuan for 65 percent of the total number of finfish farmers. The premium income was CNY 320 million. The loss ratio was 60 percent. The sum insured was set on the production cost basis. Farmers revealed that the production of grass carp, for example, mainly includes costs of seed, feed, labour and water quality improvement. The average cost was about CNY 9.2 per kg of which the feed cost alone was about 80 percent.

In 2013, there was an earthquake in Ya'an of Sichuan province. It affected 53 insured farmers who reported a combined production loss of 75 tonnes. Groupama Avic Insurance paid an indemnity of CNY 260 000.

It is worth noting that there were not many claims and low loss ratios in freshwater finfish culture insurance in China. The reasons are: (i) farmers have developed effective risk management measures from the long tradition of freshwater fish farming (for example, seed quality control, aeration system, disinfection to kill pathogen, water supply system and quality control); and (ii) commercial feed companies also provide technical advice that improve farming practices and performance. The farmers are mostly concerned with natural disasters.

7.6 Shrimp culture insurance

In China, white shrimp (*Litopenaeus vannamei*) aquaculture has practically replaced black tiger prawn (*Penaeus monodon*) aquaculture. In 2013, the production of white shrimp was 1.43 million tonnes, which was almost 90 percent of the total shrimp production. However, it decreased in 2014 to 1.2 million tonnes (78 percent of the total shrimp production) due to disease outbreak. There are three models of shrimp insurance being piloted in China, i.e. mutual insurance, commercial insurance under a policy-oriented programme, and cooperative plus commercial insurance model. The cases are described below.

7.6.1 Shrimp mutual insurance

In Ningbo municipality of Zhejiang province, the mutual insurance programme for white shrimp was piloted by Ningbo Fishery Mutual Insurance Association. In 2013, the programme targeted large scale individual farms with culture area of 100 mu or above and cooperatives with a combined area of 100 mu or above. The programme compensated for the production losses caused by natural disasters and diseases under the following conditions:

- windstorm: with the record of and certified by the marine surveillance centre or the county meteorology station, and when the wind speed reaches 11 degrees (103–117 km/hr) and causes mortality or escape from collapse of pond dyke, facility damage, and seawater encroachment.
- rainstorm: with the record of and certified by the county meteorology station, and when the rainfall reaches 70 mm within 12 hours, or 100 mm within 24 hours, and causes mortality or escape from flooding, collapse of pond dyke, facility damage, fence toppling, or deterioration of water quality.
- flooding: mortality or escape caused by water or mud flooding, seawater encroachment, and damage to pond and other facilities.
- thunder: with the record of and certified by the county meteorology station, and when it causes damages to the electrical system, aerators, pumps and gates.
- disease: mortality from epizootics of white spot (WSSV) and taura (TSV) viral diseases.

‘A waiting period’ was set at 20 days after stocking (i.e. culture period from day 1 to day 20). During this period if any damages against the insured perils occurred, no indemnity was paid. The coverage period was 70 days from day 21 to day 90 for an open pond system and 50 days from day 21 to day 70 for a plastic sheet covered pond system.⁵

The insured amount was CNY 5 000 per mu with a premium rate of 8 percent. Premium was CNY 400 per mu, of which the insured farmer paid 35 percent and the municipal and county governments each subsidized 32.5 percent.

The total compensation is calculated based on standard compensation plus daily compensation (Table 20), with respect to production loss rate which defines the compensation rate to be used for each claim (Table 21). The number of days paid for the daily compensation amount was counted from culture day 21 up to the culture day reported for claim settlement. The formula is as follows:

⁵ Plastic sheet covered helps increase temperature, which shortens the culture period.

Total compensation = (total standard compensation + total daily compensation) × compensation rate

whereas

Total daily compensation = daily compensation rate × (culture day reported for claim – 20 days)

Table 20. Compensation schemes for white shrimp insurance in Ningbo municipality of Zhejiang province, 2013

Culture system	Culture period indemnified	Compensation	
		Standard rate (CNY/mu)	Daily rate (CNY/day/mu)
Open pond	Day 21 to day 90	820	20
Plastic sheet covered pond	Day 21 to day 70	828	28

Note: Culture period from day 1 to day 20 is a waiting period, no compensation in any cases.

Source: authors.

Table 21. The compensation rates in correlation with stock mortality rates for white shrimp insurance in Ningbo municipality of Zhejiang province, 2013

Level of mortality	No. of dead shrimp (pieces/m ²)	Compensation rate (percent)
Low	5–20	15
Medium	21–40	30
High	> 40	80

Source: authors.

When a farmer files a claim, the assessment team should assess the mortality and identify the causes on-site within 24 hours. The team and the farmer then sign a document to express agreement on the results. If the disease or diseases could not be identified on-site, samples are sent to a certified laboratory and the results should be reported within 15 days.

A bonus was given to a farmer who makes no claim. If there is no claim in the previous year, the premium is reduced by 10 percent of the amount previously paid; if none in the previous two consecutive years, the premium is reduced by 20 percent.

The 2013 pilot programme insured 26 farms with a total area of 2 000 mu. The reduced premium rate was offered to farmers during this initial stage, so that the total premium income was only CNY 310 200, which was less than half of the expected income. At the end of the cropping period, 24 farmers made claims and were paid a total indemnity of CNY 480 000. The loss ratio was 155 percent. The experts explained that the stock mortality was possibly caused by poor seed quality and extreme weather.

White shrimp farming became a major subsector in Ningbo fishery. In 2014, there were 98 000 mu of white shrimp culture area, with production value of CNY 517 million. The programme insured 152 farms with an aggregate area of 6 163 mu (around 6 percent of total culture area). The total premium earned was CNY 2.5 million. Claim made was for 4 686 mu for which the total indemnity paid was CNY 2.3 million. The loss ratio was around 90 percent. In 2015, the situation improved. The insured area increased to 20 867 mu. The total premium income was CNY 8.3 million or 3.3 times higher than that of 2014. The indemnity paid was CNY 6.3 million for a loss ratio of 76 percent. The main reasons for the significant improvement appeared to be the improved farm practices particularly on the control over seed quality as well as technical support to the farmers that helped them reduce production risks.

7.6.2 Shrimp commercial insurance

The commercial insurance for shrimp farming was piloted in Rudong county in Jiangsu and in Shanghai municipality. Starting in 2014, the White Shrimp Association of Rudong County and the China Union Property Insurance Company collaborated on a policy-oriented insurance programme, with the approval of the China Insurance Regulatory Commission. The development of the insurance scheme was initiated by Rudong county

with advice from the farmer cooperative of Rudong. The scheme was endorsed by the local government and implemented by the China Union Property Insurance Company in 2015.

The insured signed an insurance contract with the company. It insured against production loss caused by typhoon, rainstorm, thunder and diseases (i.e. taura syndrome and white spot syndrome). The programme set the minimum farm size at 30 mu. There were 33 farmers who participated, with a total area of 3 400 mu. Total sum insured value was CNY 6.8 million.

The insured values differ by culture systems with the same premium rate of 8 percent (Table 22). Note that for a plastic covered system, farmers can grow two crops per year in a crop cycle of 70 days. For an open pond system, it is usually one crop per year in 90 days; farmers stock fish after the harvest.

Table 22. Insured values and premium rates of shrimp commercial insurance in Rudong county of Jiangsu province, 2015

Culture period	Plastic covered system			Open pond system		
	Insured value (CNY/mu)	Premium (percent)	Premium (CNY/mu)	Insured value (CNY/mu)	Premium (percent)	Premium (CNY/mu)
First crop	2 000	8	160	3 500	8	280
Second crop	3 000	8	240	-	-	

Source: authors.

7.6.3 Shrimp farming cooperative plus commercial insurance

In Shanghai, insurance for white shrimp culture was organized by a shrimp culture cooperative and the Anxin Agriculture Insurance Company. The programme received 80 percent premium subsidy from the municipality. The pilot was carried out to cover production loss at an insured value of CNY 2 500 per mu. Premium was 18 percent or CNY 450 per mu.

The cooperative and Anxin Agriculture Insurance Company applied a model called ‘cooperative plus commercial insurance’. The cooperative was responsible for the organization of the insurance programme with member farmers and provision of technical support to Anxin Agriculture Insurance Company, particularly on routine risk management, disaster identification and damage evaluation. The insurance company agreed to give a bonus to the cooperative if the loss ratio was lower than 60 percent.

This model is advantageous to both parties. The company provides professional insurance service to the cooperative while the cooperative lends technical support to the company even as it helps its members with advice and materials to reduce production as well as marketing risks.

In 2015, the cooperative adopted the good aquaculture practice standard for white shrimp culture and the closed system. This prevented contamination of ponds and entry of pathogens, which reduced the use of drugs and chemicals. It contracted a reputable seed company to ensure quality of stock. All these had contributed to improved production and profitability. It was reported that the average net return was CNY 8 022 per mu, which was CNY 2 800 more than the previous year’s (i.e. 2014). In the 2015 crop, the cooperative reported a loss ratio of 53 percent for which the company, as it had promised, provided 7 percent of the premium income as bonus to the cooperative. The money was distributed to members for the purchase of chemicals and probiotics for water quality improvement.

8. LESSONS AND RECOMMENDATIONS

This section distils the lessons learned from various cases and offers recommendations on these aspects: policy and legal support, a national infrastructure for fishery and aquaculture insurance, the role of government subsidy, the advantages of diversified insurance schemes, promoting awareness of insurance as a risk management instrument, and building up and maintaining a wider pool of participants.

8.1 Policy and legal support and organization

The central government has committed strongly to insurance as a risk management tool. To facilitate the provision of insurance service to fishers and aquaculture farmers, the government issued clear policy guides and regulations for players. Foremost is Document No. 1, which includes the revised agriculture insurance regulation, and guidance on fishery and aquaculture insurance programmes.

The regulatory framework provides clear guidelines for the numerous authorities, agencies and companies that make up the national system for fishery and aquaculture insurance in China. The core of the system is a strong national institution with regional and provincial outreach that regulates, promotes, and administers the mutual insurance system. The CFMI association was formed as a civil public organization rather than as a specific insurance organization. The arrangement proved effective in providing property and personal protection for fishers. The association has the largest membership of fishing vessel owners, fishers and farmers. It carries out the majority of the insurance programme in China, underlined by mutual help among members. It works in collaboration with provincial mutual associations through the bureau of fishing vessel inspection stations, which conducts annual fishing vessel inspection authorized by MOA.

CFMI has been operating for a few decades and has accumulated useful experience and built up the expertise to administer mutual insurance. It has contributed to providing relief and compensation for property damage, life loss and accident injury for fishers. Its role has recently extended to providing risk sharing opportunities to aquaculture enterprises and broadened to include services that fall under the category of social responsibility. Mutual associations in a number of provinces provide advice and material assistance to government agencies, farming and fishery communities that help prevent or reduce the occurrence of risks from serious disasters, reduce or relieve the impacts of disasters, and cope with the aftermath of catastrophes.

To strengthen and promote mutual insurance, the China Insurance Regulatory Commission announced, in January 2015, the mutual insurance organization supervision measures, which clearly defined the legal status and operating procedures of mutual insurance organizations. This in turn stimulated and drew central, provincial and local government support to fishery and aquaculture development.

8.2 Subsidy for insurance premium

In China, premium subsidy for grain, cotton, oil plant, swine and cattle had been long included in the budget of the central government. The provincial and local governments likewise have provided funds for premium subsidy of these commodities. While premium subsidy for fishery and aquaculture has yet to be included in the central government budget, several provinces including Jiangsu, Guangdong, Shanghai, Sichuan, Zhejiang have provided budgetary allocations for premium subsidy to fishery and aquaculture insurance.

The premium subsidy rate varies from place to place based on the economic development status of the local government. The subsidies ranged from 20 to 80 percent of the premium. The premium subsidy, as expected, has encouraged more farmers to join the insurance programme. In Sichuan, Jiangsu and Shanghai, the high percentage of premium subsidy for aquaculture (i.e. 60–80 percent) proved to be a strong incentive for participation.

Premium subsidy is a public investment by which the government shares the risks. Just as important, it can reduce the government's burden of relief, recovery and rehabilitation from disasters. These are invariably very costly and often sudden that they strain government financial resources. Insurance can lessen the strain.

8.3 Diversified and innovative insurance models and products

Other than mutual insurance, commercial insurance is encouraged under the policy-oriented programme in which subsidies for premium are provided. Commercial insurance is provided by private companies through their provincial and municipal branches, and by international insurance and reinsurance companies. Each insurance programme has to be approved by the China Insurance Regulatory Commission. The commercial insurance companies cooperate with the local government, fishery administrative agencies, and aquaculture cooperatives in the provision of aquaculture insurance. The models 'mutual plus commercial' and 'cooperative plus

commercial' have proved successful in finfish aquaculture insurance in Anhui province and shrimp aquaculture insurance in Shanghai. The commercial insurance company benefits from using the expertise of fishery and aquaculture cooperatives in risk identification and assessment. Both parties benefit from incentives, such as a bonus for a low loss ratio or a reduction in premium for a claim-free year, that encourage farmers to adopt better management practices that reduce production risks.

There is also a need to develop more types of insurance schemes for aquaculture. The index insurance based on wind speed, temperature, and hydrological parameters that have been piloted gave promising results. The review suggests the development of more index-based schemes that are tailored to different aquaculture species, culture systems, and the need and circumstances of the insured.

The insured participate in a programme according to their understanding of and ability in risk management. In Jiangsu, for example, life and medical insurance was purchased by the inland fishers while in Zhejiang the marine fishers mainly purchased insurance on owner's liability, vessel damage, life, and injury. Insurance product designs should be developed based on a clear understanding of needs and risk management capacity of fishers and farmers.

8.4 Insurance awareness and promotion

There is a need to improve the levels of understanding and awareness of insurance for fishery and aquaculture. CFMI has realized the importance of insurance awareness. Among other efforts, it has published a magazine on China Fishery Mutual Insurance and successful stories of insurance programmes, policy and practices for fishery and aquaculture are also released to the mass and social media.

The fishery extension stations have also taken on the responsibility of promoting insurance programmes. They arrange study visits to successful programmes for technicians, fishers and farmers.

8.5 A wide pool of insured

It is important to the business of insurance, both for the insurer and the insured, to have a wider pool of insured. In mutual insurance, the number of participants is crucial. The large number of fishers and fishing vessels enables the accumulation of a sizable amount of premium, which the mutual association can allocate for compensating heavy loss. Individually and operating without the national infrastructure, local mutual associations would have a limited capacity to underwrite insurance contracts, hedge against undesired exposure to loss, and provide compensation.

REFERENCES

- Bureau of Fisheries of Ministry of Agriculture of China (农业部渔业局).** 2015. *Zhongguo Yuye Nianjian (中国渔业年鉴)* [China fishery yearbook 2014]. Beijing, China Agriculture Press (中国农业出版社).
- Dong Zilong (董自龙).** 2013. *Woguo Yanhai Yuye Huzhu Baoxian Fazhan Licheng Ji Moshi (我国沿海渔业互助保险发展历程及模式)* [Development of fishery mutual insurance and its model in China]. *Journal of Lianyungang Technical College (连云港职业技术学院学报)*, 2: 9–13.
- Ge Guanghua & Lou Yong (葛光华, 楼永).** 1997. *Zhongguo Yuye Baoxian De Xianzhuang Ji Fazhan Qianjing (中国渔业保险的现状与发展前景)* [Current status and prospect of China fishery insurance]. *China Fishery Economy Research (中国渔业经济研究)*, 6: 22–23.
- Hu Jiahui & Wang Xiaobo (胡家辉, 王晓波).** 2006. *Qianxi Zhongguo Yuye Baoxian Moshi De Xuanze (浅析中国渔业保险模式的选择)* [Some comments on the scheme of China fishery insurance]. *China Fishery Economy (中国渔业经济)*, 2: 64–67.
- Qin Lu & Zhai Liushuan (秦鲁, 翟留栓).** 2015. *Zhongguo Shuichan Yangzhi Baoxian Xianzhuang Ji Fanzhan Tedian Fenxi (中国水产养殖保险现状及发展特点分析)* [On the current status and development of aquaculture insurance]. *Fishery Information & Strategy (渔业信息与战略)*, 30(1): 10–16.

- Roberts, R.A.J.** 2007. *Livestock and aquaculture insurance in developing countries*. FAO Agricultural Services Bulletin No. 164. Rome, FAO.
- Sun Yinshi & Li Dongxiao (孙颖士, 李冬霄)**. 2009. Guanyu Tuijin Jianli Zhengcexing Yuye Baoxian Zhidu De Zhengce Jianyi (关于推进建立政策性渔业保险制度的政策建议) [Suggestions on the fishery policy insurance system]. *China Fishery Economy (中国渔业经济)*, 1: 60–65.
- Tong Chunfen & Yin Yue (同春芬 殷越)**. 2014. Gonggong Chanping Lilun Shijiaoxia Yuye Hubao Xiehui De Fazhan Gunjing Fenxi (公共产品理论视角下渔业互保协会的发展困境分析) [Constraint analysis on fishery mutual insurance association based on the public product theory]. *Journal of Shandong Agricultural University (Social science) (山东农业大学学报(社会科学版))*, 63(4): 21–26.
- You Guiyun, Deng Yumei & Du He (游桂云, 邓瑜梅, 杜鹤)**. 2012. Shangdongsheng Yuye Baoxian Fazhan Xianzhuang Yu Duice Yanjiu (山东省渔业保险发展现状与对策研究) [Research on fishery insurance development status and strategies in Shandong]. *China Fishery Economics (中国渔业经济)*, 31(3): 40–47.
- Yu Yaguai (俞雅乖)**. 2010. Haiyang Yuye Baoxian Zhidu De Moshi Xuanze: Hubao Jichushang De Zhengcexing Yuye Baoxian (海洋渔业保险制度的模式选择: 互保基础上的政策性渔业保险) [Model selection for marine fishery insurance programme: policy fishery insurance based on mutual insurance]. *Rural Economy (农村经济)*, (9): 71–75.
- Zeng Xingcun, Liu Fei, Liu Mingbo & Lv Ruixian (曾省存, 刘飞, 刘明波, 吕瑞贤)**. 2011. Zhongguo Yuye Baoxian Xianzhuang Fenxi He Fazhan Moshi Tansou (中国渔业保险现状分析和发展模式探索) [Study of the status and development mode of China's fishery insurance]. *China Fishery Economy (中国渔业经济)*, 29(3): 36–47.

APPENDIX

Wind-force scales used in index-based insurance in China

Degree	Speed (m/s)	Speed (km/hr)	Degree	Speed (m/s)	Speed (km/hr)
0	0.0–0.2	<1	10	24.5–28.5	89–102
1	0.3–1.6	1–5	11	28.5–32.6	103–117
2	1.6–3.4	6–11	12	32.7–36.9	117–133
3	3.4–5.5	12–19	13	37.0–41.4	134–149
4	5.5–8.0	20–28	14	41.5–46.1	150–166
5	8.0–10.8	29–38	15	46.2–50.9	167–183
6	10.8–13.9	39–49	16	51.0–56.0	184–201
7	13.9–17.2	50–61	17	56.1–61.2	202–220
8	17.2–20.8	62–74	≥18	≥61.2	≥220
9	20.8–24.5	75–88			

Note: 1 m/s = 3.6 km/hr

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