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Current situation and prospects of the domestic aquaculture product market in China

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ABSTRACT

China is the largest producer of farmed seafood in the world, the total aquaculture production reaching 33.93 million tonnes in 2005. In China, the market for aquatic products is abundant in variety and sufficient in supply. Recently, the market system for aquaculture products has been developing very rapidly, and the total turnover of aquaculture products has been increasing steadily. The consumption of aquaculture products in mainland China has been increasing year after year. Per capita annual consumption by urban and rural households was 8.35 kg and 3.29 kg, respectively, in 2005 and is estimated to reach 10.23 kg and 4.17 kg, respectively, in 2010. In the future, production will increase through culture strategy changes and via science and technology development in aquaculture. It is estimated that the total production from aquaculture will reach 45.5 million tonnes in 2010, and thus the market for aquatic products has bright prospects for the future. The import/export of aquaculture products is estimated at 4 million tonnes and is expected to account for 30 percent of the total seafood trade by 2010.

INTRODUCTION¹

The development trend of Chinese fisheries has transformed into “aquaculture dominance”

Since the founding of the People’s Republic of China in 1949, Chinese fisheries, influenced by the idea of stressing fishing and neglecting aquaculture, have been relying on the marine fisheries and thus have been restricted from development. After the implementation of the policy of reform and opening-up, China, as one of the world’s large fishing countries, has carried out the policy of “zero growth” in fishing production and “summer fishing ban”. In addition, based on China’s actual conditions, the government adjusted the development priority of fisheries and realized a historic transformation from “fishing dominance” into “aquaculture dominance”.

The policy of reform and opening-up and the establishment of the aquaculture dominance principle have promoted the fast and vigorous development of marine and freshwater aquaculture in China. At present, more than 70 percent of the world’s aquaculture output is from China, which brings about changes in the structure of production of the aquatic products. With the sound development of China’s breeding industry, the output of Chinese aquatic products has remained number one in the world for 11 consecutive years.

¹Source for data: Statistical Yearbook of China’s Fishery, China Statistical Yearbook, 1999 to 2005.

SUPPLY OF AQUACULTURE PRODUCTS IN THE CHINESE MARKET

Location of supply sources of aquaculture products close to local market

The output of marine aquaculture in 12 coastal provinces and cities plus that of inland areas accounts for 70 percent of the total output in China. If that of Hunan, Hubei, Anhui and Jiangxi provinces is counted, the output of sea aquaculture in those areas comprises up to 90 percent of the total output in China.

Currently, all areas in China are developing the culture of various aquatic products with wide distribution. As a result, the sources of supply of aquatic products are located closer to the local markets, and thus the market supply has become more convenient and timely.

Increasing supply volume of aquaculture products in the market

In recent years, China has witnessed the sound development of the breeding industry. The total output of aquaculture products keeps increasing, which effectively guarantees the supply of aquatic products to the Chinese domestic market. In 2005, the total output of aquaculture products in mainland China was 33.933 billion tonnes, including 20.085 billion tonnes from inland aquaculture and 13.848 billion tonnes from marine aquaculture. The facts indicate that the market for aquatic products is becoming more prosperous.

Aquaculture products accounting for half of the supplies in aquatic market

The breeding industry in China has been growing rapidly with an increasing proportion of aquaculture output to the total output of aquatic products. Influenced by the policy on the structure of the Chinese fishery industry, the output from marine aquaculture has increased significantly faster than that of inland aquaculture for a period of time. Currently, the proportion of the output of inland and seawater aquaculture to the total output of the aquaculture industry has been gradually increasing. For instance, in 2005 the outputs from inland and seawater aquaculture grew by 5 percent and 3 percent, respectively, in proportion to the total output of aquatic products, as compared with similar figures for 1999.

Five major sorts of products of sea and freshwater aquaculture developing with special features and making market supply abundant

In line with the aquaculture and local conditions, both inland and seawater aquaculture are developing production in five main commodities, namely fishes, shrimps and crabs, shellfishes, algae and other species. This development has enriched the supply of aquatic products in the Chinese market.

Of the five main commodities, fishes account for the largest absolute amount. The production of common fishes such as grass carp, silver carp and bighead carp, carp, Crucian carp, white bream, triangular bream and black carp accounts for 65 percent of the total output of freshwater aquaculture, while cultivated shellfish account for the majority of production from seawater aquaculture.

Increased market supply of processed aquaculture products

The amount of aquaculture products being processed is increasing gradually. The products to be processed include common eel, tilapia, silver carp, large yellow croaker, *Macrobrachium rosenbergii*, prawn, *Penaeus vannamei*, swimming crab, mud crab, oyster, mussel, ark shell, scallop, clam, razor clam, kelp, *Undaria pinnatifida*, laver and pearl powder. However, most of the aquaculture products on sale are fresh fish, which require less processing. For example, the total amount of freshwater aquaculture products processed accounts for only 5 to 10 percent of the total quantity of aquatic products processed in China and only 2 percent of the country's total output of aquatic products.

Quality of the market supply of aquaculture products is constantly improving

In China, the aquaculture industry's development strategy is "high quality oriented", with the aim of producing safe and healthy aquatic products. According to the basic requirements of the Chinese market access system for aquatic products, the aquaculture industry in China is supplying pollution-free, green and organic aquatic products of high quality to consumers.

CIRCULATION OF AQUACULTURE PRODUCTS IN THE CHINESE MARKET

Market supply system of aquatic products in China is improving gradually

The main form of the circulation channel of aquatic products in China is: from the producing areas of the aquatic products → to the wholesale markets in the producing areas → to the wholesale markets in the sales areas → to the markets and supermarkets of farm produce → to the consumer (hotels, restaurants, cafeterias, home).

The circulation channels and network of various aquatic products in different forms constitute the market supply system of aquatic products in China. In this system, the wholesale markets play a significant role. Meanwhile, the commercial outlets such as various markets and supermarkets of farm produce, large supermarkets and large food shopping areas are also the main supply channels of aquatic products.

In addition, the laws and regulations, standards, and inspection and testing systems of the aquatic products for quality safety are improving, which has effectively guaranteed the safe, high-quality, sufficient and highly efficient supply of aquaculture products.

Trade in various wholesale markets of aquatic products is developing rapidly

The wholesale markets of aquatic products in mainland China have developed rapidly, with a growing turnover in domestic market of aquatic products. In 2004, the turnover stood at CNY 237.01 billion. The volume of business was 22.50 million tonnes, which accounted for 46 percent of China's total aquatic production.

In 2000 and 2004, the number of wholesale markets of aquatic products in China with a turnover of over CNY 100 million reached 52 and 72, respectively. In large wholesale markets of aquatic products, wholesale is the major trading mode, while other trading forms are playing an active role too. For example, in 2004 the turnover of the wholesale markets of aquatic products was CNY 52.25 billion. The volume of trade of wholesale business was CNY 47.42 billion and of retail business, CNY 4.83 billion. In addition, the volume of trade of retail business accounted for 10 percent of the total turnover.

The agents of aquatic products are active in the distribution

Based on some research, the author holds the view that there are now relatively few large-scale aquaculture enterprises in China. Eighty percent of the aquaculture output is from private businesses. Due to the dispersed distribution of aquaculture production and waters, as well as the asymmetry of production and marketing information, the intermediary businessmen, agents and big marketing companies of aquatic products play a major role in facilitating the fishermen to send their aquatic products from the producing areas to the local wholesale markets. The agents of various aquatic products are aware of the circulation links, and they link the markets of aquatic products at various levels in the marketing or producing areas swiftly. They are playing a vital role in meeting the urban consumption demand for various fresh aquatic products.

WIDE RANGE OF DIFFERENT CATEGORIES OF AQUACULTURE PRODUCTS IN THE CHINESE MARKET

Taking Shanghai as an example, the volume of trade in aquatic products is on the rise year by year. At present, about 400 000 to 500 000 tonnes of aquatic products in Shanghai markets are consumed, with abundant species ranging from common fishes

like Crucian carp, to high-grade aquatic products like river crab, to various rudd and shellfish, as well as imported aquaculture products like salmon. The major varieties being traded in Shanghai's aquatic product markets include grass prawn, lobster, black tiger prawn, *Macrobrachium rosenbergii*, river shrimp, river crab, mud crab, *Siniperca chuatsi*, perch, snakehead, river eel, softshelled turtle, salmon, bullfrog etc. According to the statistics for several large wholesale markets of aquatic products, the total output of the above aquaculture products reached 130 000 tonnes in 2004.

Prices of aquaculture products in the market tend to be steady

As the production is constantly growing, the market price of aquatic products, which has declined in varying degrees, is currently tending to be steady. Taking Shanghai as an example, from 1995 to 2004 the market price of the common aquaculture products such as grass carp, black carp, white bream, silver carp, spotted silver carp, carp and Crucian carp tended to be steady, while the price of special aquatic products like river crab, softshelled turtle, *Siniperca chuatsi* and river eel had fallen.

Aquaculture products are becoming upmarket food

Some traditional top-grade products like river eel, *Siniperca chuatsi*, softshelled turtle and river crab are entering ordinary households thanks to the gradual decrease of prices. Some imported species like largemouth bass and channel catfish have been accepted by the markets with a relatively stable consumption volume. The concentrated consumption of high-grade aquatic products during traditional festivals and holidays is diminishing. At the same time, aquaculture products have become upmarket food regardless of seasons and holidays.

Further increase in quality awareness of the consumption of aquaculture products

In recent years, affluent Chinese people have been paying more attention to high-quality meals. All consumers focus on the improvement in the production environment of aquatic products, gradually intensifying the demand for high-quality aquatic products produced under safe and sanitary conditions.

Analysis of the influence of aquaculture products' import and export on the domestic market in China

The consumption of imported aquatic products in mainland China is continuously on the rise. China imports more than 700 000 tonnes of edible aquatic products, if fish meal, products processed with foreign-supplied raw materials and imported products of other industries are excluded. The major imported commodities are 300 000 tonnes of frozen fish, 120 000 tonnes of shellfish and some shrimps and crabs. Import of aquaculture products plays an important role in supplementing species of domestic origin consumed in China. For instance, the import of grass shrimp bred in Thailand and of sea-farmed salmon from Norway can satisfy the demand for medium and high-grade aquatic products in the market.

The Chinese Government attaches great importance to the export development of aquatic products, especially the exportation of various kinds of sea-farmed aquatic products, which not only meets the demands of the international market, but also improves the global competitiveness of China's aquaculture industry.

Analysis of consumption volume in the market of aquaculture products

Cities and towns in China serve as the major markets of aquatic product consumption. The Chinese consumer's average expenditure on aquatic products and food expenditure is increasing year by year, the former accounting for 7 percent of the total expenditure on foods. At the same time, the rural aquatic product market is developing vigorously.

According to statistics, the annual consumption of various aquatic products (including aquaculture products) per capita by urban and rural families reached 12.48 kg and 4.49 kg in 2004, respectively. From 1999 to 2004, the annual rate of increase in consumption by urban citizens was 3.83 percent, while consumption by rural citizens grew by 3.28 percent.

ANALYSIS AND PROSPECTS OF STABLE DEVELOPMENT IN THE CONSUMER MARKET OF AQUACULTURE PRODUCTS IN CHINA

Analysis of motivation to increase consumption of aquatic products

Consumption motivation one: the consumption of aquaculture products will increase with the expanding population.

China's population will increase by 10 million each year in the future. According to a related analysis, household consumption of aquaculture products will increase by 85 000 tonnes over that of the previous year if the annual consumption volume of aquatic products per capita by Chinese citizens is 8.50 kg. The annual increase of aquaculture product consumption would be 200 000 tonnes more than the previous year if other forms of aquatic product consumption (such as expenditure on meals in restaurants and other eateries) are included.

Consumption motivation two: the rise of gross domestic product (GDP) per capita and income leads to year-on-year increase of consumption volume.

China's GDP per capita has greatly increased since the implementation of the policy of reform and opening-up, reaching CNY 14 040 in 2005. Meanwhile, as the Chinese people's income has also increased drastically, the annual per capita consumption by volume of aquatic products in urban and rural areas is increasing year by year.

Studies indicate that a similar phenomenon in aquatic product consumption with a feature of "high income with high consumption and low income with low consumption" appeared during the decade from 1993 to 2003. For example, the per capita consumption of fish and shrimp by those Chinese residents with the lowest income was 6.66 kg in 2003, while it was 16.77 kg for the residents with the highest income. Therefore, the increase in aquatic product consumption is obviously influenced by the income level of the Chinese people.

Consumption motivation three: with the enhancement of healthy consumption awareness, the proportion of aquatic product expenditure to food expenditure is going to rise.

At present, the majority of Chinese residents are constantly pursuing a healthy way of life and paying more attention to nutritional and healthy foods. Aquatic products, a kind of healthy food with high protein and low fat, enjoy high popularity among the Chinese people, who attach increasingly higher importance to their consumption.

Consumption motivation four: the process of urbanization transforms agricultural populations into urban residents, thus increasing the consumption of non-staple food like aquatic products.

Urbanization transforms a great percentage of the agricultural population into urban citizens engaged in non-agricultural sectors. At the same time, these peoples' consumption habits are also becoming closer to that of urban areas. The consumption volume of aquatic products by urban residents is two times larger than that of their rural counterparts, therefore, the transformation from agricultural population into urban citizens speeds up the consumption of aquatic products and other secondary foods.

Consumption motivation five: the aquatic product consumption in western regions is certain to increase with China's great development in western economy

Statistics show that aquatic product consumption per capita in the western regions is lower than that of eastern China, which results from differing cultural customs and consumption habits. But the economic development and mobile population in

this region are bringing changes to people's customs and habits in aquatic product consumption. According to some statistics, the consumption volume of aquatic products in China's western provinces represents different degrees of growth in the past few years. Therefore, with more frequent economic exchanges between the western and eastern regions, aquatic product consumption in western regions is going to show huge potential in development.

Consumption motivation six: the expenditure on meals out of home is rising every year, which promotes the increase in aquatic product consumption

The proportion of urban citizens' expenditure on meals out of home to food expenditure is going up rapidly, rising from 8.0 percent in 1992 to 20.8 percent in 2005. The expenditure per capita on such meals was CNY 607.23 for Chinese urban residents in 2005. Aquatic product consumption accounts for an important part of people's expenditure on meals in restaurants and other eateries, which contributes partly to the rising consumption of aquatic products.

Consumption motivation seven: in Chinese residents' consumption structure of "fish, meat, poultry and eggs", the proportion of aquatic product consumption is going to rise.

The analysis of changes in consumption structure of "fish, meat, poultry and eggs" indicates that the aquatic product consumption of urban residents accounted for more than 19 percent of the total consumption volume of fish, meat, poultry and eggs, while meat took up 52.2 percent in 1985. However, in 2003, the proportion of aquatic products rose to 23.2 percent, up 4 percent; while meat declined to 41.3 percent, down 8 percent. Furthermore, the consumption of poultry and eggs both increased to a certain extent. A similar phenomenon also appeared in rural areas.

The proportion of aquatic product consumption to the total of fish, meat, poultry and eggs rose from 10.5 percent in 1985 to 16.8 percent in 2003, while the consumption of meat declined from 70 percent down to 54 percent. All these fully indicate that Chinese people have begun to pay great attention to aquatic product consumption, which is playing an increasingly important role in the present dietetic structure.

Sustainable development of the aquaculture industry in China will ensure market prosperity

The market-oriented aquaculture industry in mainland China will continue to develop via the quality-profit growth mode, relying on scientific and technological advancement to ensure enough supply in the aquatic product market. The estimated annual rate of increase in aquaculture products is about 6 percent. China's aquaculture products may reach 45.5 million tonnes in 2010, accounting for 75 percent of the total products.

Meanwhile, China carries out scientific and technological innovation, reasonably utilizes water areas for aquaculture to gradually improve the output per unit area and breeding quality, and intensifies the restructuring of aquaculture production, which leads to the successful development of various kinds of new high-quality aquaculture species. China's aquaculture industry can thus realize sustainable development as well as ensure the further advancement and prosperity of its aquatic product market.

Prospects of stable development of aquaculture product market in China

Analyzing from the consumption volume of aquaculture products, Chinese residents' annual consumption of aquaculture products per capita is steadily on the rise. Their consumption reached 8.35 kg and 3.29 kg in urban and rural areas, respectively, in 2005, and is estimated to reach 10.23 kg and 4.17 kg in 2010. At the same time, expenditures on meals outside of the home (including that on aquatic products) are likely to account for 25 to 30 percent of the total food expenditure.

The development of the Chinese market is linked to global development. China will continue to develop its import and export of aquatic products, the total volume

of aquaculture products among the total import and export accounting for about 30 percent. To further enrich the supply of species in the domestic market, China needs to import one million tonnes of edible aquatic products each year. It is estimated that in 2010 China will export four million tonnes and import four million tonnes of aquatic products, including foreign-supplied raw aquatic materials for processing and one million tonnes of imported edible aquatic products.

As the import and export volume of foreign-supplied raw aquatic materials for processing accounts for less than 10 percent of the total supply volume in China's aquatic product market, if excluded, no obvious impact will be made on total domestic consumption. Therefore, the domestic suppliers can meet the domestic demand for aquaculture and other aquatic products in mainland China.

Looking to the future, opportunities and challenges coexist. Aquaculture is still the main field where China's fisheries will make further progress. The policy of "aquaculture dominance" will remain the guiding principle for the long-term development and modernization of China's fisheries. China's aquaculture products market exhibits a trend for growth.

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Export and industry policy of aquaculture products in China

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ABSTRACT

As the major country in aquaculture and seafood trade in the world, China has been adjusting its production structure continually to explore the most applicable and profitable aquaculture and fisheries process, keeping sight on both domestic and global markets. In 2006, the export value in aquaculture exports was reported to account for 50 percent of the entire export value for fish and fishery products. Also, the exports for some major aquaculture species such as eel, shrimp, shellfish, crab, tilapia and catfish, have a regional distribution, professional production and industrial business operation. However, further improved capability in quality and safety control for aquaculture products and how to achieve a high-quality and stable raw material supply should be the key issues for China's seafood exports, because there are problems and factors still affecting the exportation of Chinese aquaculture products.

INTRODUCTION

I'd like to express my gratitude for this opportunity to make a presentation. My topic is "Export and Industry Policy of Aquaculture Products in China". Yesterday, Mr. Li Jianhua, the Director-General of the State Fishery Administration under the Ministry of Agriculture, made a full elaboration on the progress and experience of China's aquaculture industry, as well as its contribution to China's trade. Now, I will focus on some statistics in this regard for your reference.

INTRODUCTION TO THE PRODUCTION AND EXPORT CHANGES OF AQUACULTURE PRODUCTS IN CHINA

Since the adoption of the fishery development principle "Breeding Predominance in China" in 1985, the Chinese fishery sector has experienced two important stages in its development: the total output of aquatic products leaped up to number one in the world in 1990; while in 2002, the export of aquatic products ranked the highest in the world. China has evolved from a country previously confronted with an insufficient supply of fish into a large fishery producer and a major aquatic products exporter (Table 1).

The decade from 1996 to 2006, which witnessed a vigorous development in the aquaculture industry in China, is also the most significant period in the history of Chinese fishery development. The proportion of output from sea-farming to fishing has improved from 56:44 in 1996 to 68:32 in 2006, with an aquaculture growth rate of 12 percent in the decade. The export of aquaculture products has tripled in the same period. Although the exported aquatic products still dominate the fishery in China in general, the percentage of exported aquaculture products has gradually been

TABLE 1
Summary of Chinese fishery production, 1996, 2006

	1996 (10 000 tonnes)	2006 (10 000 tonnes)	Growth rate, past ten years
Total output	3 288	5 290	61%
Including sea-farming output	1 863	3 594	93%
Proportion of sea-farming to fishing	56:44	68:32	12%
Export volume	80.2	301.5	276%
Including export volume of aquaculture products	24	118	391%
Export proportion of aquaculture products	30%	39%	9%
Export value proportion of aquaculture products	39%	49%	10%
Proportion of aquaculture products exported as raw materials	2.5%	8.2%	5.7%

approaching that of the products obtained from fishing. Especially when processing of foreign supplied-materials is excluded, exported aquaculture products have accounted for 80 percent of the home-derived aquatic products in China. A basic aquaculture production layout has been shaped that comprises some high-value species, some special species like the four major fish commonly consumed in China (herring, grasscarp, silver carp and bighead carp), together with sea cucumber and abalone for the domestic market, as well as an industrial belt of advantageous aquaculture products (including eel, prawn, tilapia, yellow croaker, shellfish, channel catfish, river crab and algae, to name but a few) for both domestic and international markets.

Table 1 shows that only 8.2 percent of the aquaculture products were exported in 2006; most of them were thus consumed in China, which indicates that the Chinese aquaculture industry is, in general, not relying on export except for a very few species. Next, I would like to introduce the export situation of the major aquaculture species.

Shrimp

The year 1996 witnessed an annual output of shrimp of 89 000 tonnes, of which 15 000 tonnes (22 percent of the total output if converted to the raw materials) were exported; while in 2006, the annual output jumped to 1 240 000 tonnes and 27 tonnes (44 percent of the total output if converted to the raw materials) were exported. Great progress had been made in the exportation of some intensively processed products meeting the international market demand such as “ebi ten” (breaded shrimp) and tail-on shrimp. In 1996, frozen shrimp for raw material and frozen shrimp meat accounted for 77 percent of the total shrimp export, while intensively processed products accounted for only 23 percent. But in 2006, this number jumped to 74 percent of the total. This dramatic change was due not only to improved processing techniques, processing capability and quality safety of the raw materials, but also to some trade sanctions imposed by some countries that actually accelerated the transformation of China’s aquaculture processing industry.

The current problems in shrimp exportation mainly lie in the increase of production costs and in the instability of raw materials supply.

Shellfish

In recent years, shellfish has had a large export potential with strong momentum. In 2006, the shellfish export volume surpassed that of eels, ranking second with 292 000 tonnes of export and amounting to 13 percent of the output in terms of raw materials, while in 1996, the proportion was just about 5 percent. The key to the shellfish export development lies in the R&D and a breakthrough in processing technology to gradually improve the processing capacity based on international tastes. In addition, with the development of the economy, the overseas Chinese’s needs for shellfish also accelerated the export growth.

The main problems in terms of shellfish export lie in food safety issues like shellfish poisoning, microorganisms etc. Moreover, the different criteria used for dividing sea-farming waters in different countries could affect the trade of shellfish.

Eel

Eel is one of the earliest sea-farming species in terms of exportation from China. About 85 to 95 percent of aquaculture products are supplied for export. The past decade has witnessed great export fluctuations, with an average level of around US\$700 million.

The main problems facing eel export are firstly, drug residues and secondly, that the increased trading volume has not been accompanied by parallel benefits.

Tilapia and *Leiocassis longirostris*

These are new sea-farmed species in China, 30 percent of which are for export characterized by improved capacity in processing fillets. The major problems are the single-product market and some influence on the export due to the discrepancy in criteria of drug use and risk evaluation in different countries. Another problem is that the supply of raw materials suitable for processing is not constant.

MEASURES AND PROBLEMS

The majority of problems confronting China's aquaculture products' export sector are related to food-safety issues, which account for 60 to 70 percent of the total, followed by disorderly competition. The Chinese Government takes effective measures to solve these two problems.

Food safety measures

The law on criteria

China's Ministry of Agriculture and State Environment Protection Administration have been jointly compiling and publicizing the *Report on the State of the Fishery Environment in China* each year since 2001. The Chinese Government published the catalogue of forbidden veterinary drugs in 2002, and the *Regulations on the Quality Safety of Aquaculture* in 2003. The *Administrative Methods for Aquatic Seeds* was amended in 2004, while the new *Regulations on Administration of Veterinary Drugs* was published in 2005, endowing fishery departments with supervisory rights over drugs. Meanwhile, the local standards for veterinary drugs were upgraded to the national ones. The *Law of the PRC on Quality and Safety of Agricultural Products* was put into effect in 2006. In 1997, the *Tentative Management Measures for Quality Safety of Shellfish Production* was formulated by China's Ministry of Agriculture. Also, a series of drug use standards and pollution-free production standards have been publicized successively in the past five years.

Administrative supervision

Implemented in 1999, the national plan of control on drug residues in aquatic products has been intensified in recent years. In 2006, 2 546 samples were tested in their origins with the acceptance rate for drug residues reaching 97 percent. The Chinese Government has strengthened its administration on aquaculture since 2002, regulating production and paying great attention to carrying out such archival systems as production records and drug usage records. The marine and fishery law enforcement was launched to push the quality safety of aquatic products in 2006, and any drug-use case that violates the related law and orders will be punished with no exemption. In several quality safety cases, China's Ministry of Agriculture and local fishery departments have imposed severe punishment on enterprises that violated related laws. The Ministry of Agriculture will further enforce this work in 2007 by carrying out the registering system of export origin. Based on domestic control, stricter management

will be implemented according to the importing countries' requirements. From 2001 to 2006, many provincial and municipal governments in China invested to construct centres that combine fishery environment promotion, disease prevention and control, as well as testing for product quality safety. All of these centres are responsible for government supervision and control.

Administrative guidance

Since 2001, all aquaculture farms are required to formulate practical operating regulations and to implement confirmation of pollution-free origins and products, as well as to standardize basic construction.

Taking action to resolve vicious competition

The Chinese Government tries to develop trade associations, fully display major enterprises' leading roles and establish cooperative and economic organizations specialized in agriculture. China is working to strengthen communication and consultation with other countries and is exploring how to set standards for market access, thus resolving trade disputes.

Displaying the potential for consumption of aquatic products, balancing export surplus and mitigating export pressure so as to ensure stable development

China's recent rapid economic rise drastically improves its power of consumption. China has attracted worldwide attention for its huge dynamic and potential market. In 2006, China imported 700 000 tonnes of aquatic products for domestic consumption, an increase of more than three times from the 200 000 tonnes imported in 1996. In the past two years, the prices of some shellfish in China's domestic market are equal to that in the Japanese market. Many enterprises enjoy the benefit of a two-way choice in supplying products for both export and domestic markets. For foreign countries longing to export to China, the Chinese Government has successively established the China-ASEAN Free Trade Zone and the China-Chile Free Trade Zone, and the construction of free trade zones between China and Australia, New Zealand and Iceland is well under way. In terms of the World Trade Organization (WTO), the average import tariff on China's aquatic products is about 9.5 percent, lower than that of many other countries. Our goal is to develop the aquatic product trade through the government's unremitting efforts. However, the development of the aquatic product trade is still faced with many problems.

The quality safety of aquatic products

The conventional scattered model of aquaculture brings some difficulties to government control.

The supply scale stability of qualified sources

Some aquatic species are difficult to produce and process because of the techniques used, low quality, scattered production or smallness of scale, while others are heavily seasonal and can't meet large and regular orders placed from the international market. Meanwhile, the rapid increase in the export of aquatic products depends mainly on large-scale investment and increases in quantity. Exports based on fish used for raw materials account for a high percentage, while fine and further processing and high-quality processing contributes comparatively little, the added value of products thus being low.

The fierce competition among developing countries with similar industrial structure

Developing countries often share a similar export industrial structure, exporting similar products and targeting the same markets, which can lead to sharp increases in supply. However, the demand of certain import markets increases slowly, which can cause

a plummet in trading price and fierce competition between countries. If they trade freely according to their comparative advantages, developing countries are likely to be confined to industries that are labour intensive. Therefore, they may face difficulties in advancing their technology and be at risk of an unstable trade structure, which can result in an unreasonable use of fishery resources and energy.

Annual increases in export cost

Developing countries are faced with financing difficulties. Enterprises in developing countries also need to increase their investment in technological reform, quality and safety control for producing and processing, and on inspection and quarantine. Only in this way can they reach the ever-improving technological standards of the importing countries. In addition, developing countries face challenges such as annual increases in labour cost and difficulty in recruiting new workers.

Low level of organization and management

In the markets of developing countries, the industrial management mechanism has not been established in a comprehensive way, thus creating problems that cause decreased enterprise profits and low social benefits such as:

- blind mass production of advantageous products,
- low prices caused by competitors, and
- disorder in export competition.

Furthermore, once trading disputes appear, nongovernmental organizations (NGOs) scattered in developing countries cannot coordinate with each other on behalf of their countries and enhance management in the domestic market for the interests of the enterprises in those countries.

Unavoidable trade friction and conflict

Importing countries will use every possible means to restrict aquatic product import with the purpose of retrieving trade deficits or mitigating adverse impacts on their domestic industries. They will establish stricter standards and issue more related laws and regulations by means of both legitimate and more subtle ways.

GOALS OF CHINA'S FISHERY INDUSTRY AND POLICIES AND MEASURES FOR PROMOTING TRADE OF AQUATIC PRODUCTS IN "THE 11TH FIVE-YEAR GENERAL PLAN"

The goals of China's fishery industry in "the 11th Five-Year General Plan" are to ensure the supply of safe aquatic products, increase fishermen's income, promote sustainable fishery development and facilitate harmonious development of fishing communities.

Under the plan, China will:

- ensure the supply of safe aquatic products based on the premise of quantitative increases in aquatic products, continuously improving their quality safety level and keeping an effective supply in terms of quantity and quality;
- ensure increasing income of fishermen and sea farmers so that they get annual increases in income by implementing related government policies of improving the comprehensive efficiency of the fishery, increasing employment opportunities and reducing their burdens;
- promote the sustainable development of the fishery industry by vigorously developing a resource-conserving and environmentally friendly fishery by transforming the growth mode so as to optimize the allocation of resources, environment and essential factors of production. (We should make efforts in carrying out an aquatic creature protection action plan and preventing the decline of fishery resources as well as the deterioration of the aquatic environment, so as to create favorable conditions for sustainable fisheries development); and

- facilitate the harmonious development of the fishing community to build a new socialist fishing community characterized by developed manufacturing, favorable environment, affluent livelihood, harmony and stability by strengthening fishing infrastructure like fishing ports, organizing more training programmes for fishermen and sea farmers and optimizing the economic structure in the fishing community.

Specific policy measures

These include:

- 1) Adhering to the principle of “focusing on aquaculture, with the combination of aquaculture, fishing and processing, and taking appropriate means in accordance with local conditions and placing particular emphasis on advantageous fields”; pursuing sustainable development with high quality, high efficiency, a good ecosystem and sound safety; controlling the fishing intensity and strengthening the protection of fishery resources and the environment.
- 2) Continuously optimizing industry structure, enhancing self-innovative capability and transforming growth mode in order to build a modern fishery industry system characterized by a rational structure of aquaculture, fishing, processing, logistics and leisure fishing.
- 3) Sparring no efforts to accelerate the construction of industrial zones boasting advantageous aquatic products, so as to push forward the innovation of conventional aquaculture models as well as upgrade traditional fishery industry; intensifying the development of the fishery’s original and fine species systems, and disease prevention and control systems to facilitate a healthy and ecologically friendly aquaculture industry.
- 4) Implementing a quality safety strategy and improving the overall level of the quality and safety of aquatic products to provide safe sources for export and to establish a responsible government image in the international community; enhancing the transparency of quality safety information and improving the distribution of information to ensure its smooth transmission.
- 5) Quickening the step to realize industrialization and effectively improving systematization to establish high-level export-oriented enterprises of large scale and strong influence; establishing a number of export-oriented trade federations, thus coordinating export order in a better way.
- 6) Insisting on the coordinated development of both domestic and international markets and encouraging aquatic products from all foreign countries to enter the Chinese market so as to promote aquatic product consumption and the development of aquatic product trade. The annual China International Fisheries Expo provides favorable conditions for trade and exchange and has become the largest of its kind in Asia and the third largest globally.

Wu Hougang

President

Dalian Zhangzidao Fisheries Co., Ltd

Wu Hougang has been in charge of the Finance and Manufacture Department of the Dalian Zhangzidao Fishery Group Co., Ltd. since he became employed in 1988. In 1996 he was promoted to General Manager of the group and has been acting as President of the board since 1999. He is also Deputy Chairman of Liaoning Provincial Fisheries Association, Deputy Chairman of Dalian Industry & Commerce Association, and Chairman of Dalian Sea cucumber Association.

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Natural Choice Sea Products, professional process management – shellfish ecological aquaculture and safety control in the north of the Yellow Sea

Wu Hougang

President

Dalian Zhangzidao Fisheries Co., Ltd

ABSTRACT

This report provides an overview of the production and trade status of shellfish in China, the major producer and exporter of shellfish worldwide. Dalian City of Liaoning Province, as the major origin of the yesso scallop (*Patinopecten yessoensis*) in China, has developed ecological breeding in order to carry out marine exploration and extension for aquaculture, by focusing on its marine conservation activities. Therefore, drawing on conservation measures of ocean environment and ecological aquaculture technology, the report presents Dalian Zhangzidao Fishery Group Co., Ltd. as a leader in safety control and management systems for the culture of *Patinopecten yessoensis*. This includes marine environmental inspection, purification and comprehensive quality supervision.

INTRODUCTION

Dalian Zhangzi Island Fishery Group Co., Ltd, a fishery group originating from the Yellow Sea, now has developed into the “National Key Leading Enterprise in Agricultural Industrialization” and a listed company. I would like to share the following experience with you, which is crucial to our development

First, we have established an ecological aquaculture method that fits the sea condition and is characterized by large-scale production of shellfish and seabottom multiplication. Second, we take it as our responsibility to produce high-quality, safe sea products, paying attention to the management of processing quality from the origin of products to the market. Our aim is “To be the manufacturer of high-quality, safe and healthy choice aquatic products across the world”, for which we have been making unremitting efforts.

THE DEVELOPMENT OF ZHANGZI ISLAND FISHERY

Dalian Zhangzi Island Fishery Group Co., Ltd. was founded in 1958. It is located at Zhangzi Island, which is regarded as “a pearl on the Yellow Sea”. It is a large-scale, comprehensive, fishery stock-holding group covering a wide range of businesses including choice aquatic products breeding, multiplication and the processing and sale of aquaculture products.

The sea area

The company now having the right to exploit a seawater area of 60 000 ha along the Yellow Sea, the Bohai Sea and the East China Sea, boasts the largest yezo scallop aquaculture base and is the largest domestic group independently exploring the largest sea waters in China. The excellent natural environment and high primary productivity provide favorable conditions for developing the multiplication and culture of choice aquatic products.

The industry

Dalian Zhangzi Island Fishery Group, Ltd. is the first corporation in China to adopt the large-scale bottom-sowing multiplication of choice aquatic products, the newest offshore multiplication model, facilitating the coordinated development of economic efficiency, aquatic ecology and environmental protection. The company, boasting breeding facilities for various choice aquatic fry with the total of 25 000 waterbodies, is the high-quality breeding farm for yezo around the country and the comprehensive raw material farm in Liaoning Province. It has five advanced aquatic products processing factories with an annual processing capacity of 10 000 tonnes of scallops and 10 000 tonnes of other aquatic products, as well as an annual refrigerating capacity of 10 000 tonnes.

The management of the group

For many years, the group has kept a good business operation. Especially since the reform in 2001, it has been maintaining an annual growth rate of over 20 percent. The “Zhangzi Island” stock has become a listed company on the Shenzhen Stock Exchange.

The integration of industry, education and research

Zhangzi Island Fishery has been designated a “National-recognized Enterprise Technology Center” and has established cooperative relationships with the China Institute of Water Resources and Hydropower Research, the Institute of Oceanography, the Chinese Academy of Sciences and the Ocean University of China. They have also created a new method of industry, education and research, the “strategic cooperation and joint programs”. At present, projects in more than 20 frontier areas of fisheries are being implemented, such as those under the research programme “Project 863” in the 11th Five-Year General Plan.

Honors of the group

The group has become a “National Key Leading Enterprise in Agricultural Industrialization”, while the brand-name “Zhangzi Island” is “China’s Famous Brand”, and has been certified by the British Retail Consortium (BRC), the International Standards Organization (ISO 9001) Quality System Certification, Hazard Analysis Critical Control Point (HACCP) and Organic Food Certification, so its products are considered as pollution-free and Grade AA Green Food. The main products of the group are stichopus, disk abalones and yezo scallops, which are certified as “products with the mark of country origin”. These series of products are available in thousands of supermarkets in such countries and regions as the United States of America, Australia and Taiwan Province of China.

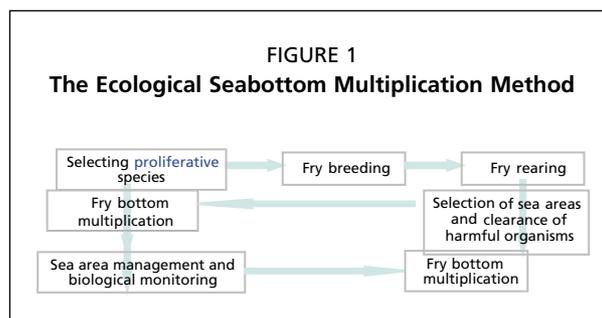
THE ECOLOGICAL BOTTOM MULTIPLICATION METHOD FOR LARGE-SCALE SHELLFISH AQUACULTURE

The Ecological Sea Bottom Multiplication Method is shown in Figure 1.

General introduction to proliferation

According to the criteria for selecting organisms used in proliferation such as the environment, market demand, economic value and research ability, Zhangzi Island has formed the fishery proliferation system focusing on the scallops, sea cucumber and abalone, supplemented by sea urchins, conch, blood clam, clam and fish. The company has explored an area of 60 000 ha

for aquaculture, 40 000 ha for yezo scallop bottom multiplication, 3 000 ha for blood clam bottom multiplication, 1 000 ha for disk abalone bottom multiplication and 1 000 ha for sea urchin bottom multiplication. It is the largest yezo scallop aquaculture production in the country and the company has independently explored the largest sea area in China. The corporation currently boasts an annual production capacity of 2 000 tonnes of yezo scallops, 400 tonnes of stichopus, 500 tonnes of blood clams, 100 tonnes of disk abalones and 300 tonnes of sea urchins.



Seed multiplication and breeding

The goal of the company is to breed fast-growing high-quality seed with stress resistance. Now the company can produce 4 billion yezo scallop seed, 200 million stichopus seed, 20 million disk abalone seed and 10 million sea urchins every year. With the conquering of the tough task of semi-artificial fry collection of yezo scallops in the natural maritime environment, the yearly output of seed can now reach 1 billion on a stable basis. To achieve the aim of breeding large-size seed in a set period, we have created a three-level breeding technique, and seed output has reached the stipulated utilization ratio (above 80 percent).

Seed proliferation by releasing

The selection criteria for choosing areas suitable for raising all the species have been set up. Investigations on the areas to be sowed must be carried out to determine the multiplication area according to the above criteria before bottom breeding, and all harmful organisms must be completely removed.

Construction of sea farms

Basic studies on the influence of sea farm construction on breeding behaviour and studies on the effects of artificial reefs and the construction of algal fields have been carried out. Over a period of five years a total of 50 million CNY has been invested in research and construction of a fish reef suitable for the multiplication of all kinds fish. During this time, we made use of 2 000 hm of sea area. Meanwhile, the ecological and economic benefits are obvious – the marine biomass per unit in the areas where the sea farm was constructed has been improved by 20 percent.

Harvesting

Harvesting is carried out with the method of diver collection and the use of a beam trawl.

QUALITY CONTROL FOR FOOD SAFETY FROM ORIGIN TO MARKET

Product quality safety shows the management ability of the corporation and even more, its core values. Therefore, it relates directly to the survival and development of the corporation. We have been strictly following the HACCP quality management system. Products marked with the Zhangzi Island Brand trademark have passed the

health standard authorization of the United States Food and Drug Administration (US FDA) and the European Union (EU). Every processing procedure is carried out with advanced techniques and under strict control, ensuring superior quality of the product. There has never been an accident concerning food safety, and the “Zhangzi Island” brand has provided consumers with safe “Choice Aquatic Products”.

A GENERAL PROFILE OF THE SEA

Zhangzi Island is located in northern Huanghui and at the southern end of the Changshan Archipelago. The nearest distance from the southern coast of Liaodong Peninsula is 44.4 km, with an area of 1 000 km² and a coastline of 58 km. As it is located at the confluence of the northern Yellow Sea and the southern Liaoning seacoast, it is generally dominated by the cold water of the northern Yellow Sea, and thus the water is of high quality and the environment is superior. It meets the Grade I of Quality Standard for State Seawater and is the cleanest seawater in China.

The control of seawater environment

We mainly focus on the control of hydrodynamic forces, hydrology, hydrochemistry, pollutants and biological organisms. The company carries out a thorough investigation of the water quality and associated microorganisms on a monthly basis (altogether 28 locations will be investigated) and entrusts the Aquatic Products Quality Supervision and Testing Center, Ministry of Agriculture (Dalian) to carry out monthly water quality testing (altogether 16 locations will be investigated).

Management for the breeding process

Provisions for Supervision and Control over the Catching of Shell Product in the Aquaculture Area in Zhangzi Island has been enacted to set a clear distinction between aquaculture area and temporary aquaculture area and to stipulate clearly on the process of breeding, harvesting, purchasing and transporting of seed. No chemical is allowed to be used in the multiplication process so as to ensure the natural growth of scallops in a natural environment. The use of contraband chemicals is prohibited.

Temporary maintenance for equipment and purification treatment

We have invested 120 million CNY on the largest shellfish purification centre – Jinbei Plaza – with a total floor area of 22 000 m². The daily processing of shellfish products can reach 200 tonnes, with a purification capability of 100 tonnes. With the latest ozone sterilization technology, our purification capability, quality and instrumentation have all reached the most advanced level in China. The yearly output of frozen products is 6 000 tonnes, 3 000 tonnes of which are cold-stored. After we adopted the newest and most advanced processing technology – “New Technical Gas Processing Technology”, the yearly output of nutritional instant food is now able to reach 1 500 tonnes.

Product processing management

The monitoring centre with China’s most advanced instruments for monitoring physicochemical parameters, microbes and heavy metals ensures the quality of our products in the market. The world’s most advanced instruments and techniques have been introduced to carry out research and the designing of optimal processing technology.

Zhou Deqing

*Director
National Center for Supervision and Test of Aquatic
Products (NCQSTAP)*



Zhou Deqing was born in June 1962. He heads the National Center for Quality Supervision and Test of Aquatic Product (NCQSTAP) and is Associate Director of the Key Laboratory of Sea Fisheries Safety and Environmental Control of the Chinese Academy of Fishery Sciences. He also is the Commissioner of Aquatic Products Process & Utilization Branch of the China Society of Fisheries and a member of the Food Professional Committee of the Chinese Association for Quality Inspection. Dr Zhou covers all aspects of processing and utilization, quantity safety and control of edible aquatic products. From 1984 to 1999, he was an instructor of biochemistry and food science and from 1999 to present, has been employed at NCQSTAP. From 2000 to 2006, Dr Zhou visited the United States and Europe several times and reviewed quality and supervision systems for aquatic products in developed countries. His principal research includes residue limits of fishery drugs in seafood safety; he published *Fishery Safety* as editor-in-chief, and has written over 30 articles on this subject. He has been involved in the foundation of the Ministry of Science and Technology of China (MOST); the “Research and Establishment of Food Safety Supervision and Precaution System for Aquatic Products” and in the “Introduction and Establishment of Current Aquatic Products Quality Control System”. He applied for research on formaldehyde in fishery from the National Natural Science Foundation. As a professor, he supervises PhD students.

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Quality safety for aquaculture products of China and its management

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ABSTRACT

In 2005 the total aquatic production in China reached 51.02 million tonnes, and per capita consumption was about 38 kg. The rapid development of aquaculture not only supplied abundant high-quality aquatic products for domestic and overseas markets but also greatly contributed to international trade. The safety aspect of aquatic products attracted the public's attention because of the rapid development of fish culture and international trade. It also directly affected the advancement of the fishery economy, as well as promoted a sound development of international trade. During the past two years, great technological progress has been achieved in our country in the area of quality and safety of aquatic products, especially during the period of the "10th Five-Year Plan". The problem of quality and safety was identified as a priority, and basic research was rapidly developed in conjunction with the legal and interrelated criteria. Moreover, the technology of control was extensively renewed. This study assesses the quality and safety of this sector, in accordance with the standards of quality control and inspection of aquatic products, as well as reviews advances in research and other related areas.

INTRODUCTION

China has a very long history in aquaculture. Thanks to the reform and opening-up policy in 1978, the Chinese aquaculture industry has witnessed growth rates of more than 10 percent every year. Since the late 1980s, the Chinese Government has advocated the policy that the development of aquaculture should be regarded as the central task of fisheries. Guided by the concept that economic benefit should be regarded as the central task, and market as the orientation in the development of aquaculture, seafarmers around China readjusted the aquaculture structure, initially developed the ecological and environmentally friendly aquaculture mode, promoted the safety mode of aquaculture, spared no efforts in industrializing aquaculture and shifted their attention from the output to the quality of the products. At the same time, they have also optimized the aquaculture species and promoted new aquaculture techniques and styles, which helped seafarmers make great achievements in the fast-growing aquaculture sector. According to the statistics issued by the Food and Agriculture Organization of the United Nations (FAO), China's output of aquaculture products (48.15 million tonnes) accounted for 34.1 percent of the world's total aquatic products in 2005 and was 2.97 times more than that of 1995, while the catch of fish was around 90 million tonnes during these ten years. In 2005, the output of aquaculture products (33.93 million tonnes) accounted for 67 percent of the total aquatic products in China

and more than 70 percent of the world total. China has set a good example in fisheries for other countries, especially developing countries, particularly in the development of aquaculture in terms of the sustainable development of fisheries and the guarantee of food safety. The development of aquaculture in China has contributed significantly to the national economy and the increase in fishermen's incomes.

The most encouraging phenomenon is that China's aquaculture products are warmly welcomed in the European Union (EU) and the United States, thanks to their uniform specification and quality, the strict control of the growing period and scale of production, the availability of the quality standard and the convenience in their preservation and shipment. Prawns, salmon, tilapia, eel, catfish and molluscs cultured in China have become major aquatic products in the international market. In 2006, the total value of the aquatic products exported from China reached US\$ 89 billion, accounting for 10 percent of the world total. Increased importance has been attached to aquaculture products in the international trade of aquatic products.

Diversification of aquaculture modes

With the advancement of modern technology, the traditional way of aquaculture that was characterized by great consumption of natural resources and other materials has been modified, while modern aquaculture, with its higher degree of human control and automation, has greatly developed. Additionally, more importance is being attached to the sustainable development of aquaculture. Many high-yield modes of aquaculture, such as industrialized aquaculture, cage aquaculture and recirculation aquaculture were used, in which ecological aquaculture was characterized by the integrated use of water and the combination of culture in the sea and on land. Thus highly efficient modes of aquaculture that make full use of energy were extensively adopted.

Continuous diversification of species cultured

There are more than 40 species presently cultured in China, while less than 10 species were farmed only 20 years ago. In freshwater aquaculture, finfishes no longer predominate. Shrimps, crabs and turtles can be commonly seen, although finfish remain the major aquaculture product. In seawater aquaculture, the range of products has been extended to include shrimp, crabs, fish and choice seafood ranging from scallops to algae. Some foreign species such as tilapia, white shrimp and southern flounder have been successfully introduced into China, which has provided a certain economic advantage.

Major expansion of aquaculture throughout China

The geographic distribution of aquaculture in China is that the eastern, central and western areas account for 80, 18 and 2 percent of production, respectively, from which we can clearly see that the eastern area plays a predominant role. Advantageous species like eel, prawn, tilapia and yellow croaker are mainly sea-farmed in the southeastern coastal area, while in the Yellow and Bohai seas, prawn, scallops and fish are the main aquaculture products, most of them being sea-farmed on an industrialized scale.

Responsible fisheries and healthy and sustainable aquaculture are put on the agenda

As the development of public living standards and the citizens' desire to be close to nature increasingly grows, the demand for high-value aquatic products will also greatly increase. To keep pace with this changing situation, we should promote the idea of "ecological aquaculture", readjust the aquaculture structure, enhance the production of hazard-free and organic aquatic products, include fisheries within ecosystem management and promote the sustainable development of aquaculture.

A BRIEF OVERVIEW OF QS (QUALITY SAFETY) FOR AQUACULTURE PRODUCTS IN CHINA

The quality of China's aquaculture products is high compared with that of other countries or previous years. The total volume of trade in aquatic products for both the domestic and export markets grows every year.

According to statistics issued by the Information Office, Ministry of Agriculture during the first regular inspection of 22 cities in China in the first quarter of 2007 for the presence of chloroamphenicol and malachite green, which was organized by the related quality inspection organizations under the mandate of the Ministry of Agriculture, the acceptance rate for the test on chloroamphenicol was 99.8 percent, while the conforming rate for the test on malachite green was 89.5 percent. There are altogether 12 cities where chloroamphenicol and malachite green have not been found: Tianjin, Zhengzhou, Nanchang, Shenzhen, Guangzhou, Qingdao, Fuzhou, Chengdu, Nanning, Shenyang, Dalian and Chongqing.

Analysis of the present situation for QS of aquaculture products

Reasons for the existence of some disqualified and unsafe aquatic products are as follows:

- excessive drug residues are left on aquaculture products because some seafarmers and companies disobey the related regulations and standards;
- problems may occur in all stages of the whole process, including during production, processing, shipment and sale of aquaculture products (for example, some disinfectants and bactericides are used to guarantee survival rate during shipment);
- exaggeration by some media – some subjective and unjust reports on the safety of aquaculture products are not based on scientific evidence (in the case of the news report “Fresh-water Fish Heads Are Inedible Due to Drug Residues” in Beijing, for example, the reporter wanted to attract the reader's attention by quoting the unscientific ideas of some so-called experts; the report, lacking scientific analysis, was not grounded on accurate statistics or confirmed in a scientific way) and
- there are still some imperfect standards for the quality of aquaculture products. (additionally, some examinations fail to offer accurate testing; for instance, some standards for the containment of abio-arsenic in algae and its style of test are to be modified).

Analysis of QS for aquaculture products for exportation

The quality of China's aquaculture products destined for exportation has been increasingly promoted. Excessive drug residues in exported aquaculture products remained the major problem in the international trade in 2006, affecting the exportation of Chinese aquaculture products. The United States Food and Drug Administration (US FDA) and Canada criticized us for the presence of residues of banned drugs such as chloroamphenicol, malachite green and nitrofurazone in exported aquaculture products in March and July 2006.

In September 2006, the US FDA for the first time sent its investigation team to China to inspect the monitoring system for aquatic products. Endosulfan was found in eel exported to Japan in June, 2006, which after investigation turned out to come from fish drugs produced by veterinary medicine factories. At the same time, the “*Scophthalmus maximus* Drug Residues Incident” and the “*Pomacea canaliculata* Spix Incident” occurred, which negatively influenced the exportation of aquaculture products.

Major problems in QS for aquaculture products

China is an important country in terms of aquaculture, and its aquaculture products account for two-thirds of the total volume of the whole world. Aquaculture

enjoyed a “leap-forward” development during the last ten years. Its development is characterized by tendencies of optimization, modernization, industrialization and internationalization. However, some QS problems are emerging due to increasingly deteriorated natural environments and aquaculture modes of higher intensity. The QS situation for aquaculture products is far from optimal, and as aquaculture develops differently from region to region, QS incidents are not uncommon. The major problems are as follows:

- epidemic diseases continuously breakout because of an unchecked chase for high productivity without respect for environmental capacity;
- seafarmers are unable to take control of the sources of pollution;
- the innovative ability of aquaculture is inadequate;
- research on substitute drugs and vaccines for fish is severely limited;
- the coverage of high-priced species is fairly low;
- technology for the development of fish feed is outdated;
- the management tools and manners of fishery departments are not adequate; and
- coordination between the responsible departments is far from desirable.

Responsible departments shoulder heavy responsibilities, so they should make unswerving efforts in QS management of aquaculture products.

QS management for aquaculture products

It's the Chinese Government's responsibility to promote the initial development of aquaculture and at the same time, to strengthen and improve the QS management following the related international standards and conventions, with a view to providing consumers with safe, high-quality aquaculture products and to meeting the demand of the importers in terms of the safety and quality of the exported aquaculture products.

During the “10th Five-Year General Plan”, Chinese aquaculture witnessed a sustainable, fast and healthy development enhanced by the readjustment of the aquaculture structure and the “market-oriented” idea. Aquaculture was also guided by the objective of “increase the benefit, upgrade the seafarmers' income and promote the competitiveness of Chinese aquaculture” during that period. To solve the problem of excessive drug residues occurring in exported products, the Ministry of Agriculture initiated specialized inspections for major banned drugs such as chloroamphenicol, enrofloxacin base, malachite green and ronidazol throughout China in order to regulate the fish drug markets, punish the illegal use of banned drugs and improve the order of the fish drug market. Additionally, the QS Standard System and the Examination & Test and Certification System have been improved, and some seafarms meeting national standards and based on hazard-free aquaculture practices have been set up. “Five Systems”, namely production logs, scientific use of drugs, monitoring of the aquatic environment, labels for products, and monitoring and control of raw materials have been initiated in some large and medium-size seafarms to assist in producing hazard-free aquaculture products for exportation. As a result of the exploration of effective management mechanisms, the whole-process objective of “from pond to table” is brought forward, the range of monitoring and control over the safety of aquatic products in urban areas is increasingly broadened, and some cities are working on the exploration of new mechanisms for the management of market exit and access.

Improvement of major related laws and regulations

The *Law of Quality Security for Agricultural Products* was issued on 29 April 2006 and came into effect on 1 November 2006. There were few stipulations concerning QS for agricultural products in the Chinese legal system before the issuance of this law, while there was no clear-cut division of responsibility among governmental departments. Many governmental departments were concerned with this issue; however, when it

came to addressing the detailed problems, there were no specified stipulations to which the law enforcement departments could refer.

The issuance of the *Law of Quality Security for Agricultural Products* for the first time solved the problem of vacuum legis on the QS for agricultural products in China. The law plays an important role in safeguarding the basic needs of the public, which is just one example of its significance. Viewed in terms of the national economy and the development of the rural economy, this law, issued when Chinese agriculture was shifting from a quantity-oriented into a quality-oriented mode, will facilitate the modernization of Chinese agriculture.

Other complementary laws and regulations also play an important role in guaranteeing QS for Chinese agricultural products, and *Regulations on Administration of Veterinary Drugs*, *Stipulations on the Management on Quality Safety for Aquaculture Products*, and *Management Methods of Seed and Fingerling in Aquaculture* are among them.

Gradual improvement of the technique standards system

The technique standards system on aquaculture has been gradually modified and perfected. In the system, the national and industrial standards will be the major parts, coordinated and complemented by the provincial and enterprise standards. The scope of standardized procedure is expanded to include pre-production, production and post-production of the aquaculture products, and more attention is paid to coordination between technique and management standards. The standards concern the production-related environment, feed, drugs, fingerlings, production techniques and quality for aquaculture products. Additionally, standards have been set for infrastructure and facility-concerned fishery engineering, fishing equipment, and materials used in the manufacture of equipment, boats and fishing gear. The range of the standards has been broadened into source environment, species, cost, processing, examination and testing, classification, and packaging and shipment. The drafting of standards for the use of fish drugs, maximum drug residues, safety of feeds and control of hazardous materials in water has experienced a breakthrough, which facilitates the drafting of standards and regulations for aquaculture, its management and the trade in aquaculture products. There are presently 640 items of national and industrial standards, including 65 national and 575 industrial standards. Of these, 224 items are on aquaculture production, 125 are on product processing, 62 are on fishing equipment and material for equipment, 56 are on fishing machines and facilities, 150 are on fishing boats, 23 are on construction of fishing projects and 70 are on hazard-free products. There are 102 compulsory standards and 538 recommended standards.

In terms of certification, recent years have witnessed the issue of certification on “hazard-free, green, and organic aquatic products” based on the standards and regulations of the aquaculture techniques for these types of products. Together with the provincial governments, the General Administration of Quality Supervision/Inspection and Quarantine of the People’s Republic of China (AQSIQ) designed incentives for the construction of model seafarms that meet the national standards.

NEW MEASURES ON QS MANAGEMENT OF AQUACULTURE PRODUCTS

Management of Aquaculture to Meet International Standards

In the 3rd session of the International Conference on Aquaculture held in New Delhi, India, in September 2006, the negative influence of aquaculture on the environment, society and other areas was brought forward; however, experience shows that these kinds of negative influences can be eased by the improvement of management, which can also facilitate the sustainable development of aquaculture. Aquaculture is experiencing fast development that can meet the increasing need for aquatic products

in the future. Therefore, all the related beneficiaries should give top priority to the management of aquaculture. The Chinese Government also attaches great importance to it and some detailed measures have been carried out.

National meeting on the QS management of aquatic products

A National Meeting on the QS Management of Aquatic Products was held in Wujiang, Jiangsu Province, from 26–27 June 2006. The speaker of the meeting pointed out that, with about 20 years' aquaculture development, China has experienced a great transition from being “fishing-oriented” to becoming “aquaculture-oriented”, and is now facing another transition that will be more dramatic and difficult. More importance will be attached to QS of aquaculture products in the future. To stick to the principle of “culturing-oriented”, we should take good care of QS of aquaculture products. We should also promote the transition from the “high productivity” mode to the “quantity and quality” and “profit and ecology” mode of aquaculture development. We should strengthen our sense of responsibility and take detailed measures to address problems in the QS for aquaculture products, so as to guarantee public health, safeguard the legal rights of seafarmers, and upgrade the exportation of aquaculture products in China.

Drafting of Action Plan on Transformation of Growth Mode of Aquaculture Industry

To implement *Opinions of the Ministry of Agriculture on Carrying out the Nine Major Actions*, and to change the old growth mode of aquaculture, the Ministry of Agriculture issued *Action Plan on Transformation Growth Mode of Aquaculture Industry* in 2006, which is devoted to changing the old growth mode of aquaculture in China, creating new modes, developing the potential, improving the quality of aquaculture products, and promoting the transition from the “high productivity” mode to the “quantity and quality” and “profit and ecology” mode of aquaculture development. In the action plan, it is suggested that 100 model seafarms that are up to the national standard, 20 model counties in the development of beach aquaculture, 10 model seafarms for prevention of aquaculture diseases, and five pilot sites for industrialized recycling seafarms be set up by the Ministry of Agriculture.

Introduction of hazard analysis critical control point (HACCP) into the QS management of aquaculture products

HACCP has been extensively applied to aquaculture all around the world. The United States, Canada, Norway and Thailand have set up their own HACCP operation modes since the 1990s. To apply HACCP to aquaculture is to take complete control of the surrounding environment of the seafarm, the water of the seafarm, the water source, fingerlings, feed and aquaculture drugs during the whole process of parents—egg—rearing of nauplii—maturity—sale. The hazard analysis of every key species should be done at every stage of the whole process and then Critical Control Points (CCPs) should be found and controlled, so as to guarantee that human health cannot be affected by aquaculture products.

Other measures

To guarantee the QS and the sanitation of aquaculture products, the Ministry of Agriculture has published a catalogue of banned drugs and has notified the US FDA of the 11 drugs banned for use in animal-derived food. In addition, the Ministry of Agriculture has also abandoned the related standard for the quality of veterinary drugs; cancelled the drug approval documents; forbidden the production, sale and use of banned drugs; and destroyed all remaining inventory. The related quality standards were modified, and a tracing system for aquaculture products was introduced. Finally, a prescription and medication file system was set up in aquaculture enterprises.

Joo Siang Ng

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Ng Joo Siang, 48, was born in Malacca, Malaysia. He graduated from Louisiana State University in 1980 with a Bachelor of Science degree in International Trade and Finance. Upon graduation, Mr Ng joined the family's timber business in Taiwan POC, before returning to Singapore to manage its grain trading, shipping and fishing businesses. In 1985, he relocated to Hong Kong SAR to help establish the seafood trading and processing businesses. The seafood business, under the name of Pacific Andes International Holdings Limited (the "Group"), was listed on the Hong Kong Stock Exchange in 1994. The Group's resource development and frozen fish supply chain management division, Pacific Andes (Holdings) Ltd, was separately listed on the Singapore Stock Exchange in 1996. In 2004, the Group further diversified upstream into deep-sea industrial fishing. The fishing division, headed by China Fishery Group Ltd, was listed on the Singapore Stock Exchange in 2006. Today, the Pacific Andes Group has a combined market capitalization of over US\$2.3 billion and group turnover exceeding US\$1 billion. It is a fully integrated group of companies with operations across the entire seafood value chain, which includes harvesting, sourcing, marine reefer transportation, food testing, processing and distribution of frozen fish products, retail-pack products, ready meals and canned products as well as fishmeal and fish oil. Its businesses span the world, with factories located in China, Japan, Thailand, United States and Peru. The Pacific Andes Group currently harvests about 600 000 tonnes and handles nearly 800 000 tonnes of fish annually, and ranks as the world's largest fish fillet producer. Mr Ng is the Vice-chairman and Managing Director of the Pacific Andes Group, overseeing all of the Group's activities, including policy formulation, strategic planning, business development and investment management. He sits on the advisory boards of the Hong Kong Export Credit Insurance Corporation as well as Rabobank's Asia Food and Agribusiness. He is also an Honorary President of the Association of China Small and Medium Enterprises and Vice-President of the International Union of Economists.

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Development of China as the world's largest reprocessing centre of frozen fish products and future challenges for the industry

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ABSTRACT

As an overseas Chinese operating in China for over 20 years, Mr Ng provides a firsthand account of the development of China's seafood processing industry in the recent decades as the country makes its transition from a planned economy into a market economy. The factors that have shaped China's seafood processing industry are discussed, including its dynamics with other seafood-producing nations, early difficulties and the perception problems faced. The various factors contributing to China's rise as the world's largest reprocessing centre for frozen fish products are also discussed. Against the key trends defining the general landscape of the global seafood industry, the increasingly complex challenges faced by China's frozen fish reprocessing industry are reviewed

INTRODUCTION

I am asked to talk about the development and future challenges of China's seafood reprocessing industry. As there are many distinguished experts from the Food and Agriculture Organization of the United Nations (FAO) and Chinese officials present at this conference, and many statistics have been presented during the last two days, I shall refrain from using too many statistics, which I also believe all of you have already been overwhelmed by. I shall simply speak from my personal perspective and experience. Please therefore pardon me in areas where you may not entirely agree with me.

OVERVIEW OF CHINA'S REPROCESSING INDUSTRY

The scope of China's seafood reprocessing industry is undeniably very wide. Hundreds of factories across China are reprocessing both domestically produced and imported fish into an array of fish products, including but not limited to salted, dried, smoked and various preserved fish products for both domestic and export markets. Just Jilin Province alone, for example, imports about 60 000 tonnes of high-grade (H/G) Alaskan pollock annually for reprocessing into freeze-dried fish for both domestic consumption and export to the Democratic People's Republic of Korea and the Republic of Korea.

Given that the scope is so large and due to the time limitation, I shall focus on the development of the Chinese reprocessing of imported frozen fish for re-export to the international market.

Although China has been exporting processed seafood products to various parts of the world since the 1960s, I would comfortably say, for many years, Japan has been the most important market for Chinese seafood products. Owing to proximity, most of

the seafood species produced in China are those conventionally preferred by Japanese consumers. Japanese conglomerates and seafood companies have also been very active in China. In fact, some of the Japanese companies possess far more in-depth and complete knowledge of the Chinese seafood industry than their Chinese counterparts do. Such knowledge includes market information, quality standards, and the facilities and equipment available at individual Chinese factories. It was the Japanese companies that first realized the low-cost advantage and potential for reprocessing in China.

Towards the end of the 1980s, many Japanese companies were already utilizing Chinese factories along the coast of China to reprocess fish imported from the then-Soviet Union, Europe and North America. Those reprocessed products were then mostly exported to Japan for further processing or repackaging for the Japanese retail market.

Subsequently, several external events that unfolded in the beginning of the 1990s played a determining role in driving the growth of the Chinese seafood reprocessing industry.

First, the Soviet Union began its development towards a market economy. Local fishing companies were all given the right to export their own catches instead of exporting through the Moscow-based Sovrybflot. As a result, huge quantities of fish catch from the Russian Far East were imported into the Chinese market. Qingdao in Shandong Province and Dalian in Liaoning Province, with their proximity to the eastern part of the Russian Federation, formed two important gateways through which Russian fish was imported into China by direct trade. At the same time, supplies also entered China through border trade, taking advantage of the then-preferential Sino-Russia border trade treaty. Some of the fish imported was sold in China's domestic market, while some was reprocessed into fish fillets for export.

Second, around the same time, Newfoundland closed off cod fishing, which created a global shortage in cod supply. Many traditional users of cod products, such as McDonald's and Burger King, as well as some fishfinger producers, were compelled to seek a substitute for cod. Alaskan pollock became the natural choice, and as a result, the United States sea-frozen Alaskan pollock fillet prices skyrocketed.

Seafood processors in China's Shandong and Liaoning provinces saw the opportunities that emerged amidst these developments and began to make use of an abundant supply of low-cost Russian pollock to produce large quantities of twice-frozen fillet to meet market demands.

Back then, the Chinese' recovery rate for producing Alaskan pollock fillet was much lower than that of today. In the early 1990s, every 10 000 tonnes of Alaskan pollock fillet produced by the Chinese plants needed about 20 000 tonnes of H/G pollock as raw material, or equivalent to about 34 000 tonnes of whole round fish. In contrast, the American factories and trawlers then needed about 59 000 tonnes of whole round pollock to produce the same quantity of fillet.

Today the Americans have a much improved yield as compared to 10 years ago. To produce the same amount of fillet, American factories and trawlers would need about 42 000 tonnes of whole round Alaskan pollock. In spite of this, the Chinese' rate of recovery is similarly improving. They now only require about 14 000 tonnes of H/G fish, which is equivalent to about 25 000 tonnes of whole round fish, without the use of any weight enhancing additives. That is a difference of 17 000 tonnes of fish. In other words, the Americans require 69 percent more fish to produce the same quantity of fillet as compared to the Chinese. China's high rate of recovery clearly represents a more effective utilization of valuable ocean resources. For anyone concerned about the long-term sustainability of global fish stocks, that is a very important difference.

Without doubt, significantly lower costs of production have also helped the Chinese to compete in the global market. Depending on product specification and complexity, production cum packaging cost for every kg of fillet is only US\$0.30 to 0.50. As compared to producing in Europe or the United States, where costs can easily run up

to more than US\$1.50 per kg, it costs only a fraction to produce in China. Moreover, freight costs from China to Europe are only US\$0.15 to 0.20 per kg, US\$0.20 to 0.30 to the United States and merely US\$0.10 to Japan. In fact, inland transportation costs within these markets can sometimes be even more expensive than direct shipping costs from China to the final destination.

Given the low capital outlay and processing costs required in China, the benefit of producing in China was further amplified. Such competitiveness has enabled Chinese reprocessing plants to produce fillets at significantly lower prices.

Producing Alaskan pollock fillets has also lessened the Chinese reprocessing industry's reliance on the Japanese market. The marketing of Chinese twice-frozen Alaskan pollock fillet has helped China to open up and develop new markets, in particular that of North America and Europe.

In order to meet the demands of these new markets, China's reprocessing plants also significantly expanded the range of fish that they processed. Besides fish from the Russian Far East, other species such as northern blue whiting, Atlantic cod, haddock, halibut, herring, mackerel and redfish from the North Atlantic; Pacific cod, black cod, yellowfin sole and flounder from North America; and hake, squid and hoki from the Southern Hemisphere, as well as shrimp and shellfish were also shipped into China for processing into fillets and various other products for re-export.

The above have laid a strong foundation of growth for the Chinese seafood reprocessing industry.

An increasing world population, growing affluence, greater health awareness and a change in dietary habits are factors attributing to rising seafood consumption worldwide. Nevertheless, increasing regulatory control on fishing and lesser illegal fishing activities in the recent years have created pressure on the supply of traditionally favoured commercial species.

At this juncture, I think it is fair to say that the Chinese seafood reprocessing industry has made the following contributions to the global food supply chain:

- increased the availability of fillet and fish products to the world market through its higher recovery rates on production;
- lowered the cost of fish products to consumers worldwide;
- provided better utilization of some previously underutilized fish species for human consumption. (Take northern blue whiting as an example. Found in the North Atlantic, it is one of the world's most abundant species, but was previously only suitable as a raw material for fishmeal because its size was simply too small to go through an automated Baader processing line. In the last few years, this fish is increasingly being imported into China to be reprocessed into fillets and re-exported to Japan, Europe and Russia); and
- provided more varieties of product form to the retail and foodservice industries. Unlike the highly automated plants of the West, Chinese plants undertake processing manually and are capable of taking on small-scale production without much loss of efficiencies. They are also able to adapt to changes in customer requirements with much flexibility.

Higher fish prices worldwide in combination with the above mentioned advantages provided by the Chinese reprocessing plants have shaped China as the world's largest seafood reprocessing centre today. Benefiting from its geographical proximity to the Republic of Korea, Japan and Russia, as well as excellent port and coldstorage infrastructure, Qingdao has become the hub of China's seafood reprocessing industry.

Since the turn of the century, there have been an increasing number of mergers and acquisitions within the global food supply industry. Consolidation of upstream fishing companies has concentrated fishery resources in fewer hands, hence enabling them to achieve the much-needed economies of scale. It has also given them stronger bargaining power in demanding higher selling prices for their fish.

Consolidation on the downstream side of the supply chain, on the other hand, has enabled supermarket retailers and foodservice companies to exert greater pressure on their suppliers for more stable supply and lower prices. In fact, the retail chains are now so powerful that they dictate the terms of supply and frequently do not accept price increments. It is of no surprise that Chinese reprocessors and their customers, who are mostly secondary processors and/or distributors supplying to these retailers, are increasingly facing margin compression. In fact, some of the larger retail chains have already established direct sourcing policy from first producers. Although today they are still with little success, the trend is nevertheless inevitable. In order to fulfill the retailers' demand for lower-price products and to remain competitive, more and more products that are less time-sensitive and have less advantage of producing in the West are gradually being processed here in China.

ISSUES AND CHALLENGES

Although China's seafood reprocessing industry is presented with many opportunities and has bright growth prospects, it is also confronted with an increasing number of issues and challenges both externally and internally.

First, despite having only evolved in the last 20 years, China's seafood reprocessing industry is the world's largest today. Along with this rapid rise have come numerous criticisms and misperceptions. It is believed that China is able to produce such low-cost products, not only because it has cheap abundant labour, but also because it has enjoyed unfair trade advantages, and that local enterprises receive generous subsidies from the government.

According to *Seafood International* magazine, in the recent North Atlantic Seafood Conference, it was pointed out that the value of frozen cod and whitefish fillet block exports from China to Europe has increased 74 percent in the first ten months of 2006. Fillet exports were also up 41 percent to US\$741 million. Piecing this together with the common knowledge that fish resources are limited, Aker Seafoods and some Norwegian participants openly alleged that such export value growth could only have been achieved because a large part, or as much as 130 000 tonnes, of cod and whitefish being reprocessed in China was illegally caught.

This is a grave and – in my personal opinion – largely unfounded accusation. Those who have been importing seafood into China would know that Country of Origin and Veterinary Certificates issued by relevant authorities of the exporting nations must be presented to the CIQ for the issuance of an import clearance permit. It is only with this permit that goods can be cleared by the Chinese customs for import into China. To a large extent, I believe such accusations arise as a result of a lack of understanding or even unwillingness to understand China. I am not saying that there have never been businesses in China that might be involved in any unacceptable behaviour; but the same could be said for most of the countries represented here today. Our governments oversee our business sacredly, and the large majority of reprocessors in China, including Pacific Andes, strive to match and better global best practices, not just in legal sourcing, but also in efficiency, hygiene, food safety etc.

China will have to grapple with a serious perception problem internationally. There is a propensity to point a blaming finger at China, and not helping matters are sensationalized overseas media reports that often cast China's food supply industry in an unfavourable light. I remain hopeful that given time, other countries will come to achieve a better understanding of China.

Then, some of these issues are regulatory in nature. For example, since the mid-1990s, HACCP certification has been made mandatory for all processing plants supplying to the United States; the European Union (EU) also requires all processing plants supplying into the region to possess EU registration numbers. In recent years, an increasing number of British and European retailers also demand that processing plants

must possess the British Retail Consortium (BRC) and EFSIS accreditation before they can supply their products.

In addition, customers' requirements are becoming stricter. Besides product quality, they are also paying more attention to environmental and social issues in satisfying increasingly complex consumer demands. Sustainability, food miles and ethical trading are some of the key issues currently receiving attention. Customers now require product traceability and complete documentation trace from raw material import to inventory and throughout the whole production process. Increasingly, they also demand social and ethical compliance from their suppliers.

While these requirements are stringent, the industry in fact benefits from having to comply with these standards. They have driven the Chinese reprocessors to sharpen their quality of management and facilities, thus bringing the overall standards of the industry to higher levels.

However, when these requirements become unrealistically difficult to meet, the industry has to deal with the high level of costs and intensive management effort that go into satisfying them. For instance, last year Japan set maximum residual limits (MRLs) for a list of more than 810 chemicals, including veterinary drugs and pesticides, many of which they have yet to establish clear commercially practical methodologies for. Likewise, the EU has also set MRLs for over 340 chemicals. Complicating matters is the fact that there exist many inconsistencies between the regulations of different countries. While full compliance is achievable, these have nevertheless created extremely high barriers of entry to the respective markets.

Food safety is now a major issue of the 21st century. Consumers are becoming increasingly aware and there is pressure across the global food supply chain to deliver safe food products. Historically, we have witnessed several blanket bans that arose as a result of problems in singular products. To illustrate, in 2002, when chloramphenicol was found present in some Chinese products, the EU banned the import of all products of animal origin from China. The ban was subsequently lifted, but only very slowly, and only species by species. More recently, Louisiana State in the United States banned sales of all Chinese seafood products when some farm-raised catfish from China tested for fluoroquinolones. As we can see, problems in a single product can now easily escalate into an industry-wide problem.

Clearly, the individual enterprise is no longer a one-man isle. Every player's survival is now intertwined with its peers, and while pursuing individual objectives, each enterprise must also bear in mind its responsibility towards the rest of the industry. It is only by sharing a common vision and working hand in hand that we are able to bring our industry to greater heights and ensure its long-term sustainability.

With this I end my presentation. Thank you.