SECTION 3

# Special presentations and perspectives

# Demand, markets and trade of farmed fishery products in China

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## INTRODUCTION
After 1985, the aquaculture sector in the People's Republic of China developed rapidly. During this period, the structure of the fishery industry changed significantly. Shortage of farm products no longer occurred. Instead, there was abundant supply in some regions, and in other regions supply soon exceeded demand, especially of traditionally farmed fishes. Subsequently, the farmed species changed from traditional to special high-value species.

During March to May 2005, we made a study on the supply and consumption characteristics of farmed seafood from 1985 to 2003. Our findings are reported below.

## STUDY OBJECTIVES AND METHODS
### Study objectives
The study analyzed the supply properties of farmed aquatic products, the current and style of demand, the price and income elasticity of farmed fishes and the international marketing of farmed fishes. The main study species were traditional freshwater farming fishes (bighead carp, silver carp, grass carp, black carp), tilapia, freshwater prawn (*Macrobrachium rosenbergii*), scallop and sea-mussel.

From 1994 to 2003, the average output of traditional freshwater fishfarming was over 86 percent of the total output of freshwater farming. The production cost of most traditional freshwater fishes was low and seed was easy to obtain. For this reason, their price was moderate; these fishes are the most important fishery products for the population. In addition, the statistical data on output and price of freshwater farmed fishes were easy to obtain and covered a long period. Thus freshwater fishes became the first research priority for studies on price, income and consumption trend of fishery products.

The study also included tilapia and freshwater prawn (*Macrobrachium rosenbergii*) for the following reasons:
- the average price of these commodities is higher than the average price of traditional freshwater farmed fishes;
- the farming model is different from traditional freshwater farming; tilapia for instance is industrial fish farming at high density;
- different consumer preferences;
- there is a long farming history with good statistical data for these species and their output is much higher than other special farmed species.

For mariculture species, we selected scallop and sea-mussel because the output of bivalves is much higher than for other seafood. In the past 20 years, the output of farmed shrimp and fish has been much lower. The influences of farmed shrimp and fish on consumption are weak. In fact, the fast development of marine shrimp and fish farming started from the middle of last century and until 2002, there were no routine statistical data for each species in the fishery annual statistics. The other reasons were that as the consumption of scallop and sea-mussel is large and their price is moderate, it was easy to obtain the data on price.

### Study methods

From the "Chinese Statistics Almanac", we obtained the demand elasticity, income elasticity and price elasticity of different fishery products. We then studied the demand and marketing characteristics of farmed fishery products. As there is linearity pertinence between the consumption of fishery products and interpreting variables, we adopted the linearity model for studying the elasticity indices. We think the consumption (q) is impacted mainly by income of resident (y), price of fishery products (p1), price of meat and its goods (p2) and price of poultry and eggs (p3). Thus the function is as follows:

$$q=c(1)+c(2)*y+ c(3)*p1+ c(4)*p2+ c(5)*p3+\varepsilon \quad 1*$$

In function 1*, the c (1) is constant. The c (2), c (3), c (4) and c (5) are coefficients of explanatory variable and random disturbance. By the function, the income elasticity and the price elasticity are as follows, respectively:

$$E_y = \frac{dq}{dy} * \frac{y}{q} \quad E_p = \frac{dq}{dp} * \frac{p}{q}$$

As we did not have enough consumption data for traditional farmed fishes, tilapia and *Macrobrachium rosenbergii*, we adopted the definition to calculate the income elasticity and the price elasticity of those products.

### Data sources

The resident income and consumption of fishery products per capita are from the "Chinese Statistics Almanac". The consumption of marine products and freshwater products per capita is calculated by their proportion in the total fishery products on the basis of total consumption of fishery products per capita. The output data is from the "Fishery Statistic Yearbook of China" published by the Fishery Bureau of the Agriculture Ministry.

The consumption of traditional freshwater farmed fishes, tilapia and freshwater prawn is calculated by the output times consumer coefficient productive-marketing. The consumer coefficient (retail quantity/buying quantity by pond) is from our investigation. The coefficients of traditional freshwater farmed fishes, tilapia and freshwater prawn are 30 percent, 30 percent and 40 percent, respectively. The prices for them are calculated according the bargaining price of the main seafood market provided by the journal of "Scientific Fish Farming".

### THE SUPPLY CHARACTERISTICS OF FARMED PRODUCTS (1985–2003)
### Output of farmed products in relation to fishing output

In the past 20 years, the farmed output increased nine times from 3.09 million tonnes in 1985 to 30.27 million tonnes in 2003 (Figure 1). The growth rate was over 10 percent during the periods 1986–1988 and 1996–2002. With increasing farming output, the proportion of farming products to total output of fishery products also increased. In 1985 the proportion was 44 percent and in 2003 it was 64 percent. In 1993 aquaculture output had exceeded the output from capture fisheries.

Figure 1
**Growth of fishery production, 1985–2003**



Figure 2
**Marine and inland aquaculture production**
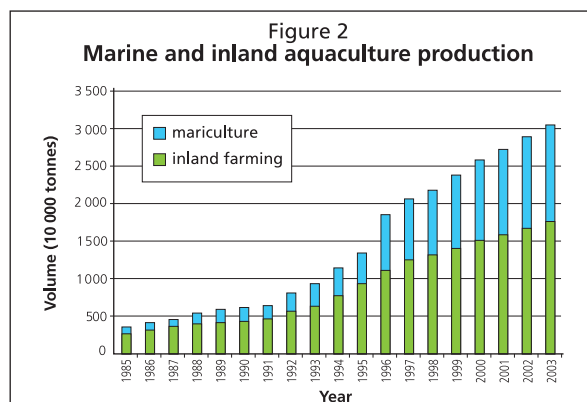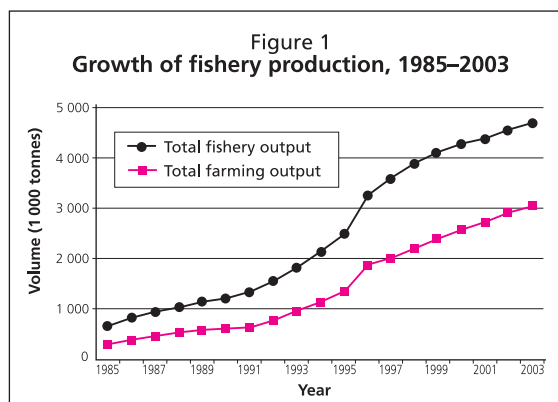
## Increasing of proportion of marine farming output

In 2003 the outputs of inland farming and marine farming attained 17.74 and 12.53 million tonnes, respectively (Figure 2). The proportion of marine farming output to total farming output increased from 23 percent in 1985 to 41 percent in 2003. The annual rate of increase was stable.
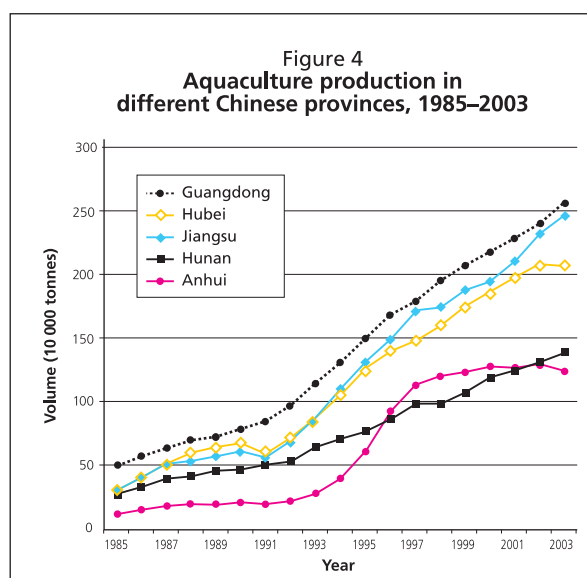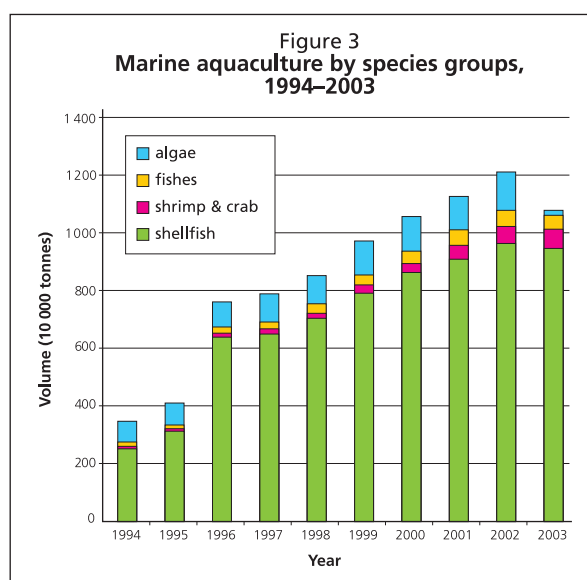
## Structural surplus of farmed fishery products

The proportion of traditional farmed fishes to freshwater farmed fishes was 86 percent in 1994 and 65 percent in 2003. In marine farming, the proportions of shellfish, algae and fishes, including shrimp and crab, to total output are 75–85 percent, 10–20 percent and 2–5 percent, respectively.
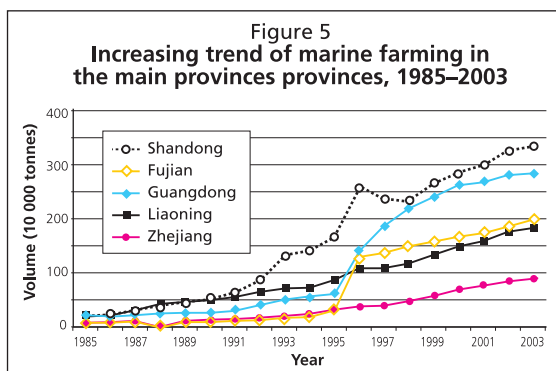
In order to resolve the problem of structural surplus of farmed fish products, the fishery administration pays attention to the adjustment of industrial structure and in recent years, the output of some special species increased greatly. A good example is the growth of tilapia. In 1994 the output of tilapia was only 0.236 million tonnes, in 2003 it rose to 0.806 million tonnes. Today the farmed output of tilapia in China is about 65 percent of the total farmed output of the world.

## Main farming area

### *Main freshwater farming area*

The main freshwater farming areas are in Guangdong, Hubei, Jiangsu, Hunan and Anhui provinces. Between 1985 and 2003, the output from these areas grew constantly. During 1986 and 1987, the growth rate was between 10 percent and 30 percent (Figure 4). Between 1989 and 1991, the growth rate was low. For instance, the output of Jiangsu Province decreased in 1991. Rapid growth rate returned in the mid-1990s.



Figure 3
**Marine aquaculture by species groups, 1994–2003**



Figure 4
**Aquaculture production in different Chinese provinces, 1985–2003**

Figure 5
**Increasing trend of marine farming in the main provinces provinces, 1985–2003**

*Main marine farming area*
The main marine farming areas include Shandong, Fujian, Guangdong, Liaoning, Zhejiang and Guanxi provinces. In 2003 the total output of these provinces was 94 percent of the total output of China. The outputs of Shandong and Fujian were 26 percent and 23 percent, respectively (Figure 5).

## DEMAND CHARACTERISTICS AND CONSUMER PREFERENCES FOR AQUACULTURE PRODUCTS

In order to make a quantitative analysis of the demand characteristics and consumer preferences, we calculated the different coefficients of farmed fishery products. The demand quantity of fishery products is affected by the level of resident income, the price of fishery products, the price of meat and its goods and the price of eggs. The different coefficients are listed in Tables 1 and 2.

TABLE 1
**Price and income elasticity of fishery products, 1994–2003**

| Year | TAC[1] | TPE | SEMFP | IEUR | PEUS | SEMFPUR | IERR |
|------|------|------|------|------|------|------|------|
| 1994 | 0.6079 | -1.5674 | 1.1873 | 0.3024 | -2.6513 | 1.7077 | 0.8600 |
| 1995 | 0.5642 | -1.5414 | 1.2899 | 0.2934 | -2.8122 | 2.0010 | 0.7570 |
| 1996 | 0.5834 | -1.5367 | 1.2679 | 0.3044 | -2.9647 | 2.0800 | 0.7792 |
| 1997 | 0.6034 | -1.5008 | 1.3038 | 0.3141 | -2.9548 | 2.1827 | 0.8071 |
| 1998 | 0.6215 | -1.3599 | 1.1436 | 0.3146 | -2.6222 | 1.8750 | 0.8624 |
| 1999 | 0.6335 | -1.1917 | 0.9743 | 0.3277 | -2.3282 | 1.6185 | 0.8567 |
| 2000 | 0.6746 | -1.2140 | 0.9612 | 0.3668 | -2.4806 | 1.6701 | 0.8478 |
| 2001 | 0.6894 | -1.1094 | 0.9192 | 0.3802 | -2.3014 | 1.6213 | 0.8412 |
| 2002 | 0.6393 | -0.8863 | 0.7791 | 0.3368 | -1.7416 | 1.3018 | 0.8384 |
| 2003 | 0.6673 | -0.8498 | 0.7693 | 0.3619 | -1.7271 | 1.3295 | 0.8227 |

[1]  TAC: Total income elasticity; TPE: Total price elasticity; SEMFP: Substitute elasticity of meat and its goods for fishery products; IEUR: Income elasticity of urban resident; PEUS: Price elasticity of urban resident; SEMFPUR: Substitute elasticity of meat and its goods for fishery of urban resident; IERR: Income elasticity of rural resident.
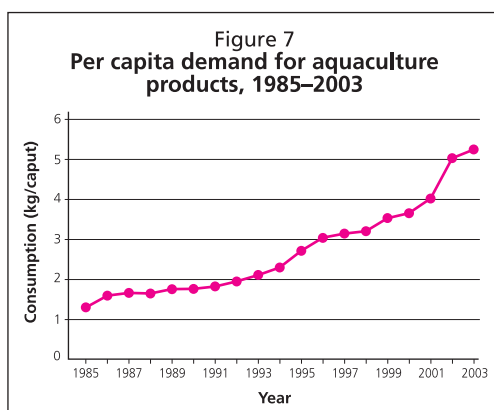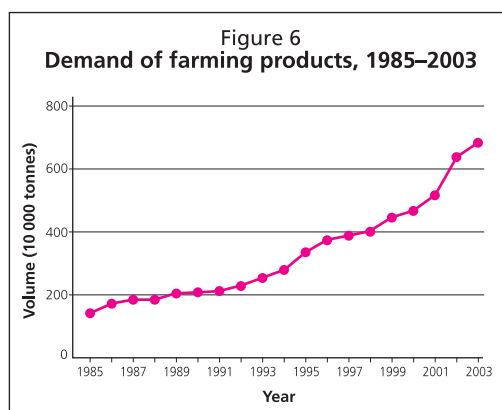
TABLE 2
**Price and income elasticity of fishery products, 1994–2003**

| Year | PERR[1] | SEMGFPRR | IEMFF | PEMFF | SEEFP | IEFFF | PEFFF |
|------|------|------|------|------|------|------|------|
| 1994 | -0.4622 | 0.6216 | 0.9162 | -0.1320 | 0.2484 | 0.8167 | 0.2166 |
| 1995 | -0.4217 | 0.6266 | 0.8602 | -0.1120 | 0.2476 | 0.7461 | 0.1902 |
| 1996 | -0.4081 | 0.5979 | 0.8308 | -0.0832 | 0.2533 | 0.8520 | 0.1993 |
| 1997 | -0.4013 | 0.6191 | 0.8705 | -0.0918 | 0.1976 | 0.8636 | 0.1961 |
| 1998 | -0.3861 | 0.5765 | 0.9602 | -0.0877 | 0.2061 | 0.9486 | 0.2002 |
| 1999 | -0.3451 | 0.5010 | 0.9209 | -0.0749 | 0.1240 | 0.8962 | 0.1614 |
| 2000 | -0.3421 | 0.4809 | 0.9911 | -0.0806 | 0.1061 | 0.9395 | 0.1791 |
| 2001 | -0.3160 | 0.4649 | 1.0239 | -0.0842 | 0.1070 | 0.9454 | 0.1725 |
| 2002 | -0.2888 | 0.4508 | 0.9614 | -0.0704 | 0.0890 | 0.8615 | 0.1424 |
| 2003 | -0.2716 | 0.4366 | 1.0193 | -0.0955 | 0.0852 | 0.8803 | 0.1957 |

[1]  PERR: Price elasticity of rural resident; SEMGFPRR: Substitute elasticity of meat and its goods for fishery products of rural resident; IEMFF: Income elasticity of marine farming fish; PEMFF: Price elasticity of marine farming fish; SEEFP: Substitute elasticity of egg for fishery products; IEFFF: Income elasticity of freshwater farming fish; PEFFF: Price elasticity of freshwater farming fish.

### Increasing of total and per capita consumption

The supply of fishery products in China is now abundant. With the growth of the population and improving incomes, the consumption and consumption preferences in China have been increasing in recent years. In 1985 the demand of fishery products was 1.36 million tonnes, while in 2003 it was 6.79 million tonnes (Figures 6 and 7).



Figure 6
**Demand of farming products, 1985–2003**



Figure 7
**Per capita demand for aquaculture products, 1985–2003**

With improving personal incomes, the demand per capita increased quickly. In 2003 the demand per capita was 5.3 kg, which is three times that in 1985 of 1.3 kg.

### Consumption demand of rural residents is lower than that of urban residents

From Tables 1 and 2, we find that the income elasticity of townspeople is lower than the income elasticity of rural dwellers. However, the price elasticity of urban dwellers is larger than in rural areas. Thus, we can conclude that the income of townspeople is relatively higher and they have a higher demand for fishery products. For the townspeople, fishery products are necessary goods, but for the rural residents, even if they have higher demand for fishery products, their income limits their consumption. We can anticipate that rural residents will enhance their demand on fishery products with an increasing income. Thus income is the most important factor that influences demand for fishery products.

The townspeople's consumption of fishery products increased from 0.779 million tonnes in 1985 to 4.5 million tonnes in 2003. Consumption in the rural area increased from 0.58 million tonnes in 1985 to 2.3 million tonnes in 2003. In 1985 the urban consumption of fish farming products per capita was 3.3 times that of rural areas; in 2003 it had gone down to 1.8 times. However, the absolute consumption in urban areas was 2.38 kg in 1985 and 5.6 kg in 2003 (Figures 8 and 9).



Figure 8
**Consumption trend of farmed products**



Figure 9
**Consumption of agriculture products per capita**
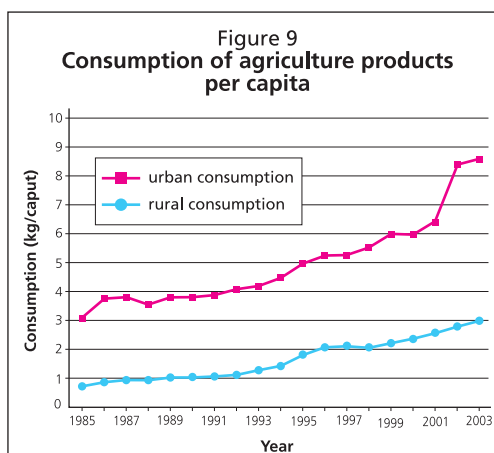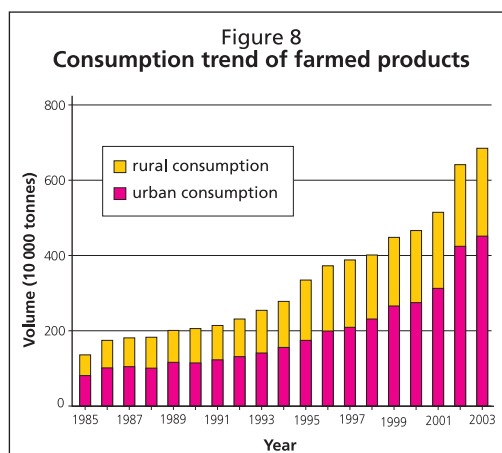
### Fishery products become necessities and population growth and urbanization raise demand for farmed fish

From Tables 1 and 2, the price elasticity of fishery products has been decreasing since the mid-1990s. This indicates that fishery products are becoming household necessities. However, during the period, the price and substitute elasticity also went down simultaneously. When the substitute elasticity is large but the price change is small, consumers will buy a substitute, which induces an expansion in price elasticity. A decreasing substitute elasticity therefore means that fish products cannot be substituted.

From 1985 to 2003, the total population of China increased from 1 060 million to 1 300 million. During the same period, the consumption per capita increased only three times, although the total consumption increased four times the growth of the population. At the same time urbanization has been drawing migration from the rural areas. These trends increased demand for farmed fish products. Studies have indicated that with urban populations increasing by 100 million, the demand for fish products increased by about 57 000 tonnes.

### Promoting marine farming mariculture

From Tables 1 and 2, the income elasticity of demand for fishery products is between 0 and 1. This indicates that the demand increases with improving income. With better transportation and refrigeration, inland people will have better access to fishery products. However, due to the limited natural resources, the capture output will not increase accordingly. The deficit will be made up by marine farming products and imports. Freshwater farming will be limited by the scarcity of freshwater resources. More investments therefore should be directed to upgrading technology and expanding the production of high-quality fishery products. To satisfy local demand, measures should be taken to import more of the fishery products that are in short supply.

### Improving marketing systems to alleviate imbalance between supply and demand

Some 80 percent of the fishery products are produced in eastern China, 18 percent in central China and 2 percent in western China. In addition, due to poor processing and freezing technology, the products can only be sold in markets near the production areas, thus making it difficult for people far away to buy fishery products. In addition, the three major fishing grounds are closed for certain periods to allow the fishery resources to recover. During this period, there is supply shortage of marine-caught products. To solve these problems, a full-functioning marketing system should be built. More processing factories should be set up in producing areas that can process the fishery products as soon as they are caught or harvested. This will reduce the transportation cost of processed products and enhance their competitive edge.
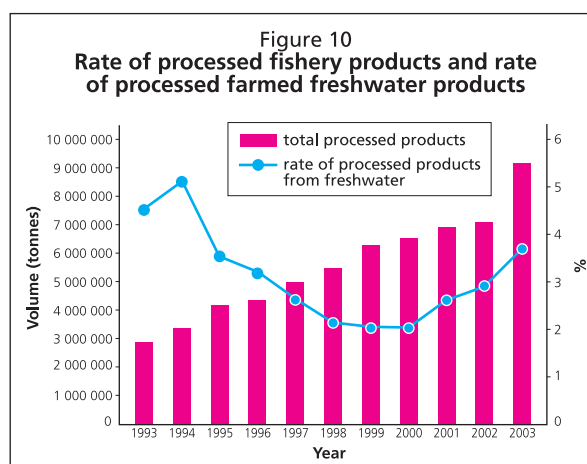
### Improving processing

Chinese prefer fresh and live fishes. With improving living standards, the Chinese people have also begun to like processed fishery products because they would like to save more time for other activities. However, problems remain in the fish-products processing industry. Firstly, the scale of processing enterprises is small. Secondly, the volume of processed fishery products is low and the technology level is low as well. Thirdly, 95 percent of Chinese fishery-products processing enterprises are located in the eastern coastal area, especially in Shandong and Zhejiang provinces, and are mainly engaged in the processing of marine products. The processing of freshwater farmed fish remains at a very low level. In 2003 the processed freshwater farmed fish was only 7.75 percent of total output, and in inland areas, the rate was even lower at 3.68 percent, although after 1999 there was a slight increase in processed products from inland areas (Figure 10).

## Increasing demand for high-quality fish products

Economic development has also stimulated increasing demand for highquality fish products. For instance, the import of salmon has risen from 25 155 tonnes in 2000 to 74 205 tonnes in 2003. The consumption of salmon is concentrated in coastal areas such as Jiangsu, Shanghai, Beijing and Guangzhou. In 2003 the volumes of imported salmon in Jiangsu and Shanghai were 55 percent and 29 percent of total salmon imports, respectively. Much of the sale is in hotels, restaurants and supermarkets. The consumers are mainly residents with high income and visitors from Japan, China, Hong Kong SAR and Taiwan Province of China.

In the past three years, it was noticeable that consumers with high income have been reducing their consumption of aquaculture products produced in China and increasing their consumption of imported products. The main reason is that these segments of the population are wary of the safety of China's aquaculture products.



Figure 10
**Rate of processed fishery products and rate of processed farmed freshwater products**

## IMPORT AND EXPORT OF CHINA'S FISHERY PRODUCTS
## Comparative advantage of the main fishery country in the world

The comparative advantage of seafood in China is favourable, and the growth rate is higher than the average for developing countries. On the other hand, it is still some distance from the progress attained by some countries, for example, Thailand.

## Characteristics of China's fishery exports

China's main agriculture products for export are vegetables, fruits, animal products and fishery products. The export value of fishery products is increasing, and the ratio in agricultural products is rising, indicating there are good prospects for China's export of fishery products (Table 3). From 1999 to 2003, the export value of fishery products increased from US$2.97 billion to 5.49 billion.

The main characteristics of the export of fishery products of China are as follows:
- Firstly, the products mostly come from the provinces along the coast. The export value of fishery products from coastal areas such as Shandong, Guangdong, Liaoning, Zhejiang and Fujian makes up 92 percent of the total. Shandong and Liaoning are the main source of processed products, and Guangdong, Zhejiang and Fujian are the sources of ordinary exports.
- Secondly, the exports are mainly farmed products and include eel, prawn and frozen fish. In 2003 the export of aquaculture products such as shrimp and eel made up 47 percent of ordinary exports.
- Thirdly, seafood is mainly exported to a few countries such as Japan, the United States of America and the Republic of Korea, as well as to China, Hong Kong SAR.

TABLE 3
**The export value (US$ billion) of fishery products, 1999–2003**

| Year | Export value of fishery products | Export value of agriculture products | Ratio of export value of seafood in agriculture products (percent) |
|---|---|---|---|
| 1999 | 2.97 | 13.39 | 22.2 |
| 2000 | 3.83 | 15.62 | 24.5 |
| 2001 | 4.19 | 16.7 | 26.1 |
| 2002 | 4.69 | 18.14 | 25.9 |
| 2003 | 5.49 | 21.43 | 25.6 |

### Characteristics of fishery products imports

China also imports a large volume of fishery products, mainly from the Russian Federation, Peru, the United States of America and Japan. The import values for these countries from 1999 to 2003 were US$1.29 billion, 1.85 billion, 1.88 billion and 2.48 billion, respectively.

The main imported products are fish flour, cod and frozen fish. The imported fishery products are increasingly varied. Some superior products such as live lobster, live crab and grouper as well as inferior fishery products are imported.

### Problems with fish trade

With rapid economic development, the trade in fishery products has achieved a high growth; but problems with exported seafood persist, including:

- technical barriers to trade are becoming more and more common;
- the system of information management is underdeveloped;
- the corporations' activities in exporting are not well organized; and
- many corporations are not aware of the importance of a brand in marketing and the advertisements about seafood are not very effective.

Among these problems, the importance of the brand in marketing is very evident. In China, there are not many seafood brands, although there are a few famous brands. However, more and more people pay attention to the brands of the products in the modern world. So it is a good opportunity for foreign corporations entering into China's market, and it is important to build the corporate image and brand. The "place brand" (place of origin) is a very important feature of the image of an aquatic product and for the production of seafood is mostly connected with the origin. For instance, salmon (Norway), tuna (Japan), lobster (Australia), hairtail from the East China Sea and scallop from the Yellow Sea are well known to consumers. Thus, the seafood companies could take advantage of the "place brand" to promote their products. For example, Norway represents 71 percent of Chinese imports of fresh and frozen Atlantic salmon and 34 percent of fresh and frozen Pacific salmon.

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