THE DEVELOPMENT AND PROSPECT OF THE AQUACULTURE IN ASIA

Chen Sun, Shanghai Fisheries University, Economy and Trade College, chensun@shfu.edu.cn

ABSTRACT

Asia has made and is making great contribution to the world aquaculture industry and fisheries civilization. The article analyzes development of the aquaculture in Asia with the production potentiality and comparative advantage index. It gets the conclusion that the aquaculture in Asia industry has promising prospect. And at last the paper discusses some concerned issues, including the diversity of biology, the protection of the environment and the antibiotic residues in aquaculture products.

Key words: Asia, aquaculture, comparative advantage

INTRODUCTION

With the development of the world economy and the higher standards of living, the demand for aquatic products is increasing daily. Therefore, the demand cannot be met only by the conventional capture. The dependence on aquaculture industry must be growing. In recent years, because of the marine resources decreasing, most of the increment of fishery production came from aquaculture, as illustrated in figure 1. In fact, both the EU and the main fishery countries are paying more attention to aquaculture industry, which makes it become one of the food industries that develop most rapidly.

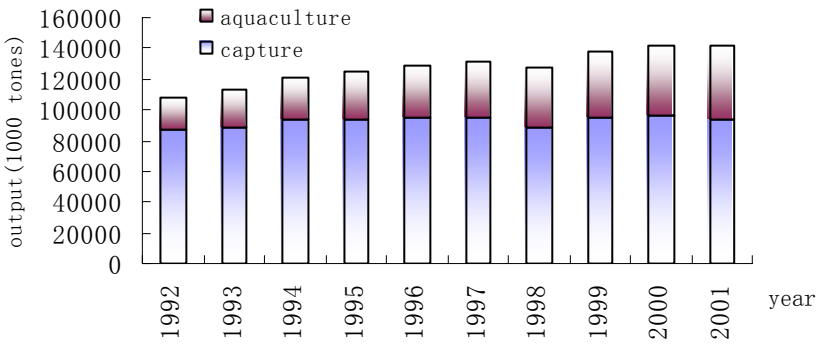

figure 1. World fishery production by capture and aquaculture

From FAO Fishery Year Book (2002).

As a continent with long aquaculture history and abundant aquaculture resources, Asia has made great contributions to the world fishery civilization. Especially in recent 10 years, there is no doubt that Asia contributes most to the increase of the world aquaculture production [1]. On one hand, as illustrated in

table I, the increasing trend of the world aquaculture production depends largely on that of Asia; on the other hand, Asia's contribution to the world aquaculture industry is increasing. In 1992, Asia contributed about 88% to the world aquaculture output. In 2001, the ratio is as high as 90%, as shown in figure 1, which means 9/10 of the world aquaculture output is produced by Asia nowadays. Asia has an important position in the world aquaculture industry.

Table I: World Aquaculture Production[a]

	fish, crustaceans, mollusks, etc		aquatic plants		all aquatic organisms	
	world	Asia	world	Asia	world	Asia
1992	1541	1311	578	572	2119	1883
1993	1780	1551	665	659	2446	2210
1994	2084	1840	694	686	2778	2526
1995	2438	2168	679	672	3117	2840
1996	2669	2379	718	705	3387	3084
1997	2864	2547	720	708	3584	3255
1998	3052	2701	860	851	3912	3553
1999	3350	2967	962	957	4312	3924
2000	3549	3149	1018	1012	4567	4162
2001	3785	3351	1056	1048	4841	4400

From FAO Fishery Year Book (2002).

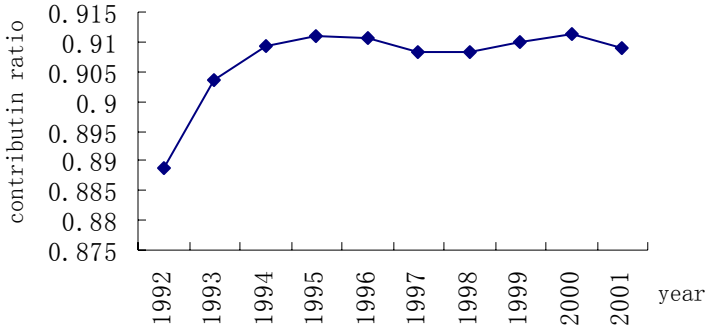

Figure 2. The contribution of Asia to the world aquaculture production

Deduced from FAO Fishery Year Book (2002).

THE ANALYSIS OF INTERNATIONAL COMPETITIVENESS OF THE AQUACULTURE IN ASIA

Asia Has Great Potentiality in the Aquaculture Development

As a continent with abundant aquaculture resources and large population, Asia has great potentiality in the development of aquaculture industry. To elaborate the point in detail, we take China as the example.

In China, there are about 20 million fishermen among which have 13 million fishery workers [2]. This is a very large number no other continent or countries can compare with. This is what gives Asia aquaculture production quite strong back. Moreover, there are nearly 1,000 million peasants in China which might offer great backup force.

In addition, there are abundant fresh and sea waters which can be used for aquaculture in Asia. Also in China, neither the possible aquaculture fresh waters nor the possible aquaculture seawaters are fully utilized. The aquaculture area can be extended. According to the general investigation data in 1993, there is 6,749,300 hm^2. possible aquaculture fresh waters and 2,600,100 hm^2. possible aquaculture sea waters. In 2001, China fresh aquaculture area is 5,469,883 hm^2.[3]. Only 81% waters are utilized, of which, especially, lakes and brooks are not used more than 50%. In the same year, sea aquaculture area is 1,344,754 hm^2.[4]. The waters are utilized less than 45%, of which shallow sea is only utilized 52%.

Asia Has Greater Competitiveness in the Main Export Aquaculture Products

In fact, the vigorous development of Asia aquaculture industry, to some extent, has proved its greater international competitiveness. If we analyze theoretically and from the point of aquatic products trade practice, we can see it more clearly.

In this point, we would utilize the data of aquatic product to illuminate the competitiveness of aquaculture product due to the inadequacy of data. But it is should mentioned that the method is applicable. Because in the classes[c] we pay great attention to, namely fresh, chilled and frozen fish(class A), crustacean and mollusk(class C) and crustacean and mollusk product(class E), aquaculture product is the main export product.

We can get the index called comparative advantage index (CAI) using the data of FAO. CAI expresses the comparative advantage reflected by the difference between the export value and the import value of aquatic product of one country, which can be got by the following equation 1. To a more extent, the index reflects the comparative advantage in the field of circulation.

$$CAI = \sum (X-M) \Big/ \sum (X+M) \qquad \text{(Eq.1)}$$

X——expresses the export value of some variety of aquatic products.

M——expresses the import value of some variety of aquatic products.

If the CAI is between 0 and 1, then it indicates that class of aquatic product has comparative advantage. The greater the competitiveness, the bigger the numerical value is, vice versa. If the CAI is negative, then that class of aquatic product has comparative disadvantage.

If we analyze the issue simply, we can derive that Asia doesn't express the comparative advantage, as shown in table II, the CAI of Asia is negative, which is nevertheless near to zero. But if considering the fact that Japan is a largest import country, we subtract Japan and other import countries, such as China H. Kong, Taiwan and Macao, the CAI will turn into positive, which express higher comparative advantages.

Table II: the CAI of Different Continents[b]

	Africa	North America	South America	Asia	Asia*	Europe	Oceania	Low income
1998	0. 4033	−0. 2194	0. 7234	−0. 0691	0. 5563	−0. 110	0. 4351	0. 6160
1999	0. 4300	−0. 2134	0. 7853	−0. 1200	0. 4985	−0. 0774	0. 4911	0. 6032
2000	0. 4812	−0. 2299	0. 7763	−0. 0998	0. 4819	−0. 0802	0. 4858	0. 5548
2001	0. 4566	−0. 2142	0. 8053	−0. 0697	0. 4449	−0. 0964	0. 4538	0. 5478

If we discuss the issue briefly, we could find Viet Nam, Indonesia and India express strong comparative advantages, whose CAI are both more than 0.9. The CAI of Thailand and China Taiwan are both more than 0.6. China mainland also expresses comparative advantage, which is decreasing in recent years. Malaysia is on the margin, which shows a little and unstable advantage, as illustrated in table III.

Table III: the CAI of Main Export Countries in Asia

	China mainland	China Taiwan	India	Indonesia	Thailand	Viet Nam	Malaysia
1998	0. 4564	0. 5327	0. 9399	0. 9454	0. 6577	0. 9908	0. 1564
1999	0. 4483	0. 5071	0. 9698	0. 9212	0. 6604	0. 9757	0. 0729
2000	0. 3347	0. 5252	0. 9829	0. 8868	0. 6964	0. 9750	0. 0808
2001	0. 3823	0. 5490	0. 9672	0. 8865	0. 5970	0. 9739	0. 0421

If we use the category of FAO[d], we can see that different countries have their own features. As shown in appendix table1~table 7, China mainland has strong comparative advantage in canned fish and processed crustaceans and mollusks, whose CAI are more than 0.97 and are increasing in recent years. Malaysia has strong comparative advantage in processed crustaceans and mollusks, whose CAI is between 0.69~0.85. Viet Nam has strong comparative advantage in processed (not canned), non-processed fish and non processed crustaceans and mollusks, whose CAI are more than 0.96. China Taiwan has comparative advantage in fresh, chilled, frozen and canned fish, whose CAI are more than 0.8 and 0.7, respectively. Thailand has strong comparative advantage in most of the varieties except fresh, chilled and frozen fish, oils and meals, whose CAI are between 0.72~0.99. India and Indonesia both have obvious comparative

advantage in fish, crustaceans and mollusks, nearly almost of whose CAI surpass 0.9.

From the trade practice of some major aquatic product, it can be also shown that Asia's aquatic products have obvious comparative advantages and bright prospect.

For example, Asia has obvious advantage in the export of tilapia and shrimps. Regarding processed shrimp, Asia countries remain the leading suppliers. As shown in table IV, China mainland and China Taiwan are the indisputable market leaders of the US frozen tilapia market with a market share of 98% of the whole frozen tilapia. Thailand remains the main supplier of shrimps to the US market accounting for 26% of total volume imports in 2003. Moreover, Chinese share of imports increased in 2003, which is from fifth place in the first quarter to second position by the end of the year. Viet Nam (12% market share) and India (9% market share) are third and fourth respectively.

Table IV: US Shrimp Importers by Region, Jan-Oct 2003

	MT	1000US$
Thailand	103436	787977
China mainland	60329	333218
Viet Nam	47598	496377
India	37894	348506
Ecuador	29652	185939
Brazil	20340	91025
Indonesia	18941	149826
Others	88984	674473
total	407174	3067341

From Report prepared by INFOFISH, March of 2004.

In brief words, the aquaculture in Asia has not only great potentiality, but also has broaden market. The prospect of the aquaculture in Asia is promising.

SOME DISCUSSION

During the past decades, the aquaculture in Asia has expanded, diversified, intensified and made technological advances. The potential of this development to enhance local food security, alleviate poverty and improve rural livelihoods has been well recognized. The prospect of the aquaculture in Asia is hopeful, but there are still some problems which should be concerned.

The Sustainability

In The State of World Fisheries and Aquaculture in 2000, it was reported that recent field studies in Southeast Asia have revealed that inland fishery resources are under threat from habitat alteration,

degradation and unsustainable fishing activities. Dam and weir construction has a long tradition in many parts of Asia. Over the last half-century, thousands of large dams have been constructed worldwide, including Asia. The number of smaller dams, weirs and other in-stream obstacles across rivers is not known on a global scale, but may be in the order of several hundred thousands.

Barriers across rivers often have negative impacts on the natural fish populations and may contribute, along with other factors, to the diminished abundance, disappearance or even extinction of species. As well as fish, other aquatic animals - or their aquatic life stages can be affected by changes to free longitudinal movements in the river [5].

On the other hand, aquaculture is one of the sources of sea pollution. Some aquaculture farms are like underwater factory farms, but with far more devastating ecological consequences. The damage is caused both by the pollution and disease created by these operations and the introduction of non-native species, all of which harms the wider marine environment. Not only do these operations have a devastating effect on the surrounding ecosystem, but they also threaten the survival of wild fish, whose lives they claim to spare.

Antibiotic Residues in Aquaculture Products

As in other animal production sectors, antibiotics are used in aquaculture during both production and processing, mainly to prevent and treat bacterial diseases. 20 antibiotics have also been recommended and used as disinfectants in fish handling, but this practice has proved to be ineffective and is generally not approved by the fish inspection services. Antibiotics have not always been used in a responsible manner in aquaculture and, in a number of reported situations, control of the use of antibiotics has not provided a proper assurance of the prevention of risks to humans [6]. During the last year, the detection of chloramphenicol in internationally traded shrimp products has caused much concern. The substance has been found in cultured products, resulting in a slowdown in imports, causing economic loss among the concerned producers and reflecting negatively on all shrimps and on aquaculture overall.

So, from the view of sustainable development of the aquaculture in Asia and the sustainable development of human being, as the rapid increment of aquaculture, something important should be considered and should be paid attention to.

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ENDNOTES

a**.** quantities in 10,000 tones.

b. Asia* is the CAI which excludes Japan and China H.Kong, Taiwan and Macao.

c, d. The major varieties of export aquatic product include fresh, frozen and chilled fish (class A), fried, dried, smoked and salted fish (class B), crustacean and mollusk (class C), canned fish (class D),canned crustacean and mollusk (class E), oil of aquatic animals (class F) and animal fodder such as fishmeal (class G).

Appendix table I: the CAI of China Mainland in Varieties

	A	B	C	D	E	F	G
1998	0.34385	0.44902	0.63423	0.99259	0.97895	−0.6439	−0.9821
1999	0.38811	0.44623	0.53043	0.98837	0.98316	−0.5557	−0.9946
2000	0.25769	0.45294	0.36515	0.99533	0.98722	−0.7230	−0.9885
2001	0.27768	0.56935	0.41621	0.99225	0.98893	−0.6971	−0.9919

Appendix table II: the CAI of India in Varieties

	A	B	C	D	E	F	G
1998	0.83181	0.99573	0.99945	0.99763	--	−0.6939	−0.9928
1999	0.93481	0.99694	0.99883	0.9874	1	−0.5398	−0.8666
2000	0.96527	0.99467	0.99771	0.93127	0.98269	−0.2188	−0.9893
2001	0.96640	0.98154	0.99276	0.48304	0.99443	−0.0977	−0.9409

Appendix table III: the CAI of Indonesia in Varieties

	A	B	C	D	E	F	G
1998	0.97664	0.98112	0.98301	0.94975	0.95623	0.60075	−0.4444
1999	0.96257	0.97223	0.96867	0.97833	0.94679	−0.7029	−0.9782
2000	0.91290	0.92687	0.96859	0.97072	0.93848	−0.8365	−0.9728
2001	0.93827	0.93583	0.96760	0.96818	0.98832	−0.9489	−0.9214

Appendix table IV: the CAI of Malaysia in Varieties

	A	B	C	D	E	F	G
1998	-0.5242	-0.6831	0.53514	0.52571	0.85017	-0.5981	0.26935
1999	-0.5573	-0.6681	0.54311	0.41447	0.74214	-0.2464	-0.1376
2000	-0.5993	-0.6228	0.54172	0.30493	0.69161	-0.6802	0.07772
2001	-0.6077	-0.6942	0.45644	0.41566	0.74391	-0.1762	0.39203

Appendix table V: the CAI of Thailand in Varieties

	A	B	C	D	E	F	G
1998	-0.2496	0.89458	0.81075	0.99839	0.98845	-0.3080	-0.1670
1999	-0.1527	0.83918	0.77727	0.99705	0.98817	-0.5715	-0.9224
2000	-0.095	0.85205	0.78005	0.99430	0.96864	-0.3731	-0.8285
2001	-0.2736	0.90102	0.72240	0.9956	0.96817	-0.7645	-0.8841

Appendix table VI: the CAI of Vietnam in Varieties

	A	B	C	D	E	F	G
1998	0.98365	0.98078	0.99631	--	--	--	0.56957
1999	0.99222	0.92370	0.98964	--	--	--	-0.4584
2000	0.98693	0.89036	0.99097	--	--	--	-0.3779
2001	0.97442	0.96995	0.98834	--	--	--	-0.1826

Appendix table VII: the CAI of China Taiwan in Varieties

	A	B	C	D	E	F	G
1998	0.82152	0.44787	-0.4348	0.73766	-0.5781	-0.4976	-0.9658
1999	0.82503	0.45064	-0.3056	0.31446	-0.5902	-0.9422	-0.9731
2000	0.80903	0.24366	-0.3253	0.80214	-0.6367	-0.8321	-0.9662
2001	0.84138	0.25418	-0.3086	0.72442	-0.6012	-0.8763	-0.9594