

Implications of historic development and economic performance of molluscan fisheries in China 1950-2017

Muhammad Mohsin¹, Yong Tong Mu^{2*}, Yin Hengbin³, Aamir Mahmood Memon², Muhammad Noman² & Ana Mehak²

¹College of Economics and Management, Jiujiang University, Jiujiang, 332005, China

²College of Fisheries, Ocean University of China, Qingdao, 266003, China

³Marine Resource Management, Wenzhou Business College, Wenzhou, 325000, China

*[E-mail: ytmu@ouc.edu.cn]

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This is the first attempt that discusses molluscan fisheries of China in terms of economic perspective. The originality of this research stems into the analysis of a long series of data, 1950-2017, 68 years covering pre and post-reform era, starting from the time when China had limited infrastructure to becoming world's largest producer of aquatic products. Since its liberation, the Chinese economy has gone through various disruptions and transformations, which include famine, Cultural Revolution and accession to world trade organization during the late 1950s, the late 1960s and in 2011 correspondingly. Coupled with various macroeconomic perturbations, Chinese fisheries sector has also gone through various transformations of its own such as the shift from inshore to offshore fishing with the passage of time. Consequently, molluscan fisheries sector has experienced remarkable changes. Molluscan fisheries landings have considerably increased from 1950 (90500 t) to 2017 (1797475 t). However, the decline in the capture production has been observed after 2000 due to overexploitation. Trade (export + import) of molluscs (volume + value) is on the move since 1984 as a result of market liberalization and development policies. The tendency for molluscs consumption is also increasing with the passage of time.

[Keywords: Molluscan fisheries; Trade trends; Landing statistics; Molluscan supply; Fishery development; China]

Introduction

This research work aims to investigate Chinese molluscan fisheries sector, 1950-2017, in terms of economic perspective. Molluscan fisheries landings, trade, and consumption figures are analysed during this study. Changes and trends in the Chinese molluscan fisheries are probed into in the context of general fisheries development with relation to molluscan fisheries and general fishery policy formulations with the passage of time. Political influence and government plans are correlated with the structural shifts to understand the economic contribution of the molluscan fisheries sector in the nation's development. Despite of internal and external shocks, overall Chinese economy continued to boom. However, since its liberation Chinese economy has gone through various disruptions and transformations including famine, Cultural Revolution and accession to world trade organization during the late 1950s, the late 1960s and in 2011 correspondingly¹.

Coupled with various macroeconomic perturbations, Chinese fisheries sector has also gone through various transformations of its own such as the shift from inshore

to offshore fishing with the passage of time². Moreover, China's distant-water fishing has expanded exceptionally. Its DWF fleet, with a number of 2460, and many more under construction, are operating in EEZ's of 40 countries and in high seas of Indian, Pacific, Antarctic and Atlantic Oceans³. Such a large DWF sector of China does contribute substantially to the nation's fisheries division, however, it also confers problems in term of diplomatic disputes with other countries⁴. Such as fishing vessel dispatch which occurred between Vietnam and China during 981 oil rig row⁵.

Presented data in this research spans over different periods of time for various parameters. Reported capture production of molluscs, 1950-2017, represents together marine and inland landings. Landing weight of molluscs denotes raw or live weight which is supposed to be different from the corresponding trade, import, and export, weights due to the inclusion of the processed products. Thus, the precise comparison in terms of volume is not plausible. The aim of this project is to portrait general comparison in order to understand molluscan fisheries economic contribution and stages.

Import and export figures, both in terms of quantity and value, are available from 1984 to 2013. However, caution is required when to consider the comparison between pre and post-reform periods due to demographic and geographic factors. Moreover, it is necessary to note that all the monetary values used in this study are nominal. The scope of this research project does not encompass fish processing industry.

Various researchers have written on different aspects of fishery development and its economic contribution in China. For instance, Kai and Lu⁶ used grey correlation analysis to evaluate the marine industry development and sustainable sea fisheries development in China whereas mariculture development in China was reviewed by Tseng⁷. Similarly, Ning-sheng⁸⁻⁹ described the importance of computerization in the fishing industry and also suggested measures to further accelerate the development in fisheries sector. Yun¹⁰ analysed trade problems of aquatic products and also gave measures to improve trade of aquatic products. Despite large volume of published literature on general fisheries of China limited information is available regarding the molluscs. Although, there are a number of studies related to molluscan fisheries in China. However, molluscs have never been discussed in terms of economic perspective. Most of the past and ongoing research on molluscs is confined to other aspects including aquaculture, genetics, disease, and ecology^{11,14}.

Current research work depicts macroeconomic development in relation to molluscan fisheries sector from 1950 to 2017. This study is divided into various sections. First section deals with the overall macroeconomic development in China. Whereas, the second section takes in to account the molluscan fisheries landing analysis. Furthermore, third and fourth sections analyse import and export trends correspondingly. Followed by trade analysis section, molluscan fisheries consumption is described in the fifth section. Finally, the summary is presented at the end, the sixth section, to sum up, all the sections to draw a final picture of the study.

Macroeconomic development in China

During pre-modern era, China was the largest economy around the globe¹⁵. However, from the last quarter of the 15th century, the Chinese GDP started to lag behind Western Europe. In China, GDP growth rate remained sluggish between 1500–1800. The conservative and centralized political systems of

Ming and Qing dynasties are usually attributed for this stagnant growth rate in GDP¹. However, according to Pomeranz¹⁶, Yangzi region of China was comparable to Europe in the 18th century in terms of economic development. The difference of economic development started to increase after Industrial Revolution in England. Later on, after two opium wars against Great Britain (1840s; 1850s) and Sino-Japanese war (1894-95), when the ongoing imperial system has been weakened, there started an era of exposed industrialization. However, this industrialization could not bring higher economic prosperity due to civil wars and World War II until 1950¹.

Since its liberation in 1949, China has made a remarkable progress in the economy. However, this epoch can be divided into two parts, pre-1978 and post-1977, on the basis of pace and scale of economic transformation¹. Soon after coming into existence, People's Republic of China planned and implemented economic reform policies which resulted in an average increase of 4 percent economic growth rate. This rate is very high, during the period from 1953 to 1978, when compared to other developing countries¹⁷. Post-1977 period has witnessed an incredible increase in the economy with an extraordinary rate of up to 10 percent per annum which is the highest rate of development. This marked contrast of economic development in above-stated eras is an output of several indigenous and exotic factors^{1,18}.

In 1949, Chinese communist government took complete control of the country from the ownership of all the sectors to trade administration. Economic transformation was done by using Soviet model¹. However, economic development continued without any significant interaction with the world¹⁸. In order to boost industrialization, the government adopted a policy of increased investment in heavy industries. Surpluses generated by forced savings were channeled into heavy industries. Unfortunately, this tricky strategy failed to produce predicted results. Consequently, the GDP rate as a whole could not increase significantly¹. GDP per capita, 1960-2017, is highlighted in Fig. 1. In addition to this Great Leap Forward, 1958-1960, turned into the Great Leap Famine¹⁹ when Chinese economy hit by the most disastrous famine of its history killing more than 15 million people. Regardless of this disappointing situation surprisingly these policies continued with minor revisions¹.

After coming into existence, China started the largest historical land reform²⁰. Ambitious agenda through *hukou* scheme was implemented. The land was taken from rich farmers and landlords and distributed, by considering population or through some other complicated criteria, among every farm household. It was compulsory to sell the major portion of the production to the state²¹. In 1958, first five-year plan of *hukou* system was executed. According to this plan, farmers were arranged into cooperatives. This organization had been completed in 1958. In fact, this system was lacking any incentive. Farmers had no right to claim their whole production. In addition to this, decision makers were mostly ignorant of the farmer’s problems²². The aim of this system was to confine farmers in rural areas. It was supposed that collective system of *hukou* should fulfill food needs of the developing urban industrial economic zones. The disparity created between rural and urban areas hindered structural transformation during the socialist era. The pace of productivity and income growth retarded²¹. The prices, both the producer and consumer, of the agricultural goods were controlled by the state²³. Marketing channel was inefficient and was also entirely directed by the state²⁴. Quantity, quality, acreage, and variety were also regularly directed by the state. The agriculture system was so delicate that it badly hit by famine in 1959²⁵. Several thousand people died because of malnutrition. Although, several other factors were responsible for famine, however, agriculture also contributed in this catastrophe²⁶.

Heavy taxes were imposed on farmers. Farmers were prohibited to engage in nonfarm activities. Hence, agricultural productivity diminished with the passage of time. However, the non-agriculture sector was in a bit good condition¹. Even in the late 1970s, around

70 percent of Chinese labor force was associated with agriculture sector but failed to provide more than 2300 calories per capita per day. In order to combat food deficiency, agricultural import was frequently done²⁷. Agriculture trade, which was envisaged to produce foreign exchange, and exchange rate overvaluation suppressed agriculture development^{28,29}. In order to meet dwindling supply of food. China started to supplement local markets by spending its meager foreign exchange on international agricultural trade²¹. Under these circumstances from 1952 to 1978, ironically the GDP rate showed an annual increase of 3 percent on an average. The reason for this unexpected rise in GDP is attributed to increase in the ratio of capital/output during the course of this time i.e. 1952 (0.91) to 1978 (2.22)¹. Available statistics of the percentage change in yearswise GDP are presented in Fig. 2.

Per capita income of farmers showed a minor increase during the socialist era. Interestingly, earnings during the 1950s and the 1970s were almost the same³⁰. Until 1978, annual per capita consumption of meat was low i.e. 6.4 kg/capita/year³¹. In a nutshell, it may be concluded that during socialist era agriculture sector did not play any significant role in national development²¹. However, until the late 1970s, Chinese socialist government policies had significant effects upon the development of agriculture. As a whole, availability of food increased with the passage of time. In contrast to the declining food production in the world, Chinese splendid policy resulted in the increased trend of food production. However, during the socialist period, mostly the consumers were not provided with the meat, sugar, oil, and vegetables and entirely relied upon rationed diets. Even in the urban areas, during the 1970s, average per capita supply of calories was just 2328 calories/capita²¹.

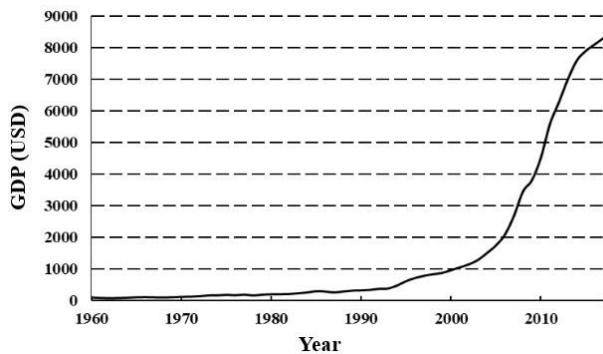


Fig. 1 — GDP per capita 1960-2017. Source: Worldbank⁵⁹

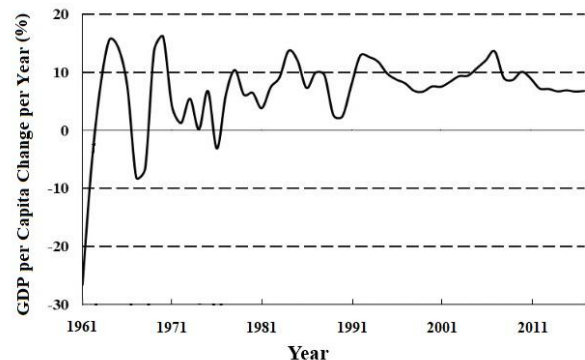


Fig. 2 — Yearly change in GDP per capita 1961-2017. Source: Worldbank⁵⁹

By the end of Cultural Revolution in 1978, Gaige Kaifang reform was adopted with an aim to further rise living standards and economic development. In order to get full privileges of the worlds growing economy, the Chinese economy was transformed into market-based export-led economy¹⁸. Post-1978 period showed more factor productivity growth in agriculture sector as compared to other sectors¹. The obvious reason for this was the food disaster which occurred in 1959. In order to increase agriculture sector's performance, the government increased prices of agricultural goods and shifted collective farming to household farming. These reforms not only improved agriculture sector productivity, by 5.62 % from 1978 to 1984 but also provided farmers with an opportunity to choose input means³². The GDP growth rate of agriculture during pre-reform period, 1970-1978, remained 4.9 % per annum. During the period from 1978-1984, agriculture sector showed the highest rate of GDP growth rate i.e. 8.8 % per annum. Whereas, during 1985-1995 and 1996-2000 periods agriculture GDP growth rate remained 3.8 % and 4.2 % in that order. Comparison of fisheries GDP during pre-reform and reform periods shows a higher rate of fisheries GDP during the reform period. It has been estimated that fishery GDP rose by 5 % from 1970-1978. However, during the reform period much higher growth rate has been witnessed i.e. 7.9 %, 13.7 % and 10.2 % during 1978-1984, 1985-1995 and 1996-2000 respectively²¹.

The agricultural development, during 1978-1984, with an increase of 47 percent led to sectoral shift. The structural transformation occurred and 19 % of human force reallocated to industrial sector²⁷. Fisheries sector has also gone through a substantial structural change from 1970 (2 %) to 2000 (11%). Fisheries sector, with more than 10 % annual increase, has become the fastest growing agriculture sub-sector in China. Fisheries structural change in 1970, 1980, 1985, 1990, 1995 and 2000 remained 2 %, 2 %, 3 %, 5 %, 8 % and 11 % in that order²¹. During the initial years of these reforms, agricultural productivity started to climb due to positive incentives. However, it became stagnant during the late 1980s. Next decade brought higher progress in the agriculture sector. Government interference decreased into the markets. Consequently, the markets were liberalized with respect to agricultural inputs and outputs²⁷. This market liberalization facilitated farmers to adopt new technologies. As a result,

agricultural productivity increased by 4.13 % during the period from 1998 to 2007³³.

As compared to the decreasing role of the agriculture sector, fisheries sub-sector continued its pace to contribute increasingly to nation's economy. In 1980, the share of this sector in agriculture gross value output was 2 %. This contribution increased gradually and reached 5 % and 11 % in 1990 and 2000 in that order. During pre-reform period, 1970-1978, average per annum growth in fishery output was 5 % which doubled in 1996-2000. The real value growth rate of inland and marine fisheries, 11.6 % and 10.1, superseded output quantity, 9.1 and 6.4. Market liberalization during the mid-1980s sped up fisheries production. Till 1995, fishery production showed a significant annual increase of 12 %. However, during this time aquaculture sector was promoted to compensate the food requirements of growing population (Fig. 3). Aquaculture sector grew rapidly and left marine sector behind. Aquaculture sector showed the dramatic annual average growth rate of 15 % during 1985-1995³⁴.

The share of fishery sector in terms of value has shown an increasing trend. In 1980 and 1985 this sectors contribution was 1.7 and 3.5 respectively. During 1990, 1995 and 2000 it further illustrated upward trend with a percentage share of 5.4, 8.4 and 10.9, respectively. Obviously, this rising contribution is a reflection of increasing fisheries economy since 1970. Fisheries sector showed an increase of 5% from 1970 to 1978, whereas, during 1979-1984, 1985-1995 and 1996-2000 its value remained 7.9, 13.7 and 10.2 correspondingly³⁴. In 1997, historic economic reform policies were made during 15th Congress of the communist party. The private sector was legally allowed to develop and ownership of state-owned firms was sanctioned. These steps created a conducive

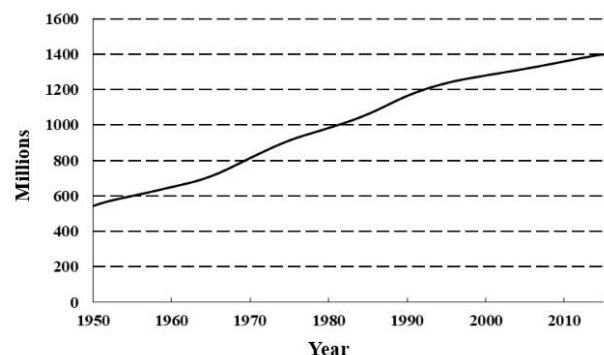


Fig. 3 — Population in China 1950-2015.
Source: Worldbank⁵⁹

environment for the rapid development especially of the private enterprises¹.

For the development of sustainable fisheries, due to overexploitation, in 1998 agenda of zero growth in capture fisheries was launched. Through this program, an attempt was made to control the number of increasing fishing vessels, catch quantities and catch during the prohibited time. Consequently, an output of marine and inland capture fisheries decreased in the following years. Even in 2000, marine and inland capture fisheries showed negative growth of -1.4 % and -2.3 %, respectively³⁴.

The rise in agricultural productivity played an important role in China's economic growth particularly during the first two decades, 1978–1988, of economic reform period³⁵. However, this contribution decreased from 2.1% to 0.6 % percent during the period 1978-1988 and 1998-2007, respectively. Factors responsible for this diminished contribution are usually attributed to decreased share of value-added agricultural plus reallocation of human resource¹. In 2001, reduced tariffs, opportunities for foreign investment and trade liberalization further accelerated the development process when China joined the World Trade Organization³⁶. That's why since 2000, China has become the fourth largest importer of agriculture products³⁷. Moreover, export quantity has almost always superseded import quantity during the post-reform period³⁸.

Molluscan fisheries landings in China

China is an Asian country located on the west coast of the Pacific Ocean. It has a long coastline spanning an area of 18000 km and stretching between the Yalujiang River and the Beilun River³⁹. China is the largest fishing nation in the world⁴⁰. Its marine waters are rich in diverse mollusc biota³⁹. Blessed with a plenty of marine aquatic resources it is no wonder that from 1992 to 2014, a total of 1874261 t of molluscs on average were landed annually in China (Fig. 4). For the past few decades, marine resources have been fully exploited. However, now there is a growing concern regarding the rational utilization of these resources. Management has led to the modification of fishery industry with the passage of time. Chinese fishery industry has gone through various phases during its evolution³⁹. This transformation is the result of socioeconomic changes, political perturbations, and policies implementations⁴¹. This transformation can be categorized into three successive phases. The period from 1950 to 1959 is regarded as the first

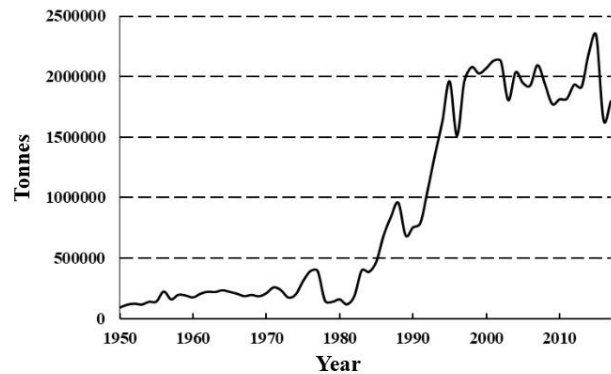


Fig. 4 — Molluscan landings in China 1950-2017. Tonnes. Source: FAO⁶⁰.

period of development. Whereas, the second period is from 1960 to 1976 during which the development remained stagnant. The third period starts from 1977 during which rapid development is witnessed in the fishery industry³⁹.

China started to reform its fisheries sector soon after coming into existence. In 1950, there started a regime of enhanced fishery production³⁹. Fig. 4 depicts the capture trend of the molluscan fisheries from Chinese marine waters. In the following years, production increased manifold, however, from 1971 it started to drop. This declined production was a consequence of continued overexploitation.

Actually, soon after liberation the government just focused on the enhancement of fishery catch by improving fishing technology and increasing the number of fishing fleet⁴¹. As a result, resource conservation received little attention. Among commercially important landed groups, molluscs (particularly squids; *Sepiidae*) showed decreased catch pattern⁴². In order to cope with this situation, the government started to implement conservation policies for dwindling aquatic resources. However, in order to compensate decreased capture production, aquaculture was promoted⁴³. Being surrounded by many fishing nations, China has signed various agreements with its surrounding fishing nations such as Vietnam, Japan, and Korea. Before 1960, Chinese and Vietnam's fishermen exploited the same maritime zone of Beibu Gulf. In 1957, the first Sino-Vietnamese agreement was signed. According to this agreement, sailboats were banned to enter into the outer limit, 3 nm, of both countries⁴⁴. In 1958, during Geneva meeting, the United Nations Convention on the Law of the Sea (UNCLOS) was formulated and most countries of the world, including China,

accepted it's, more than three hundred, laws regarding maritime issues⁴⁵. In the same year, China claimed it's maritime possession over 12 nm from the baselines⁴⁶. Later on, in 1961 and 1968, previous agreement with Vietnam was further updated and supplement protocols were agreed⁴⁴. Through these agreements, more nautical miles were agreed upon for fishing allowing greater maritime access to fishermen for higher fisheries production thus opening a door to higher fisheries catch.

Fig. 5 graphically depicts molluscan groups landed on the dock stations of China during 1950-2014. Capture figures indicate that Marine molluscs nei (G1) is the only molluscan group that showed continuous catch trend from 1950 (76900 t) to 2014 (551607 t). The average capture of this largest group, quantity wise, remained 449997 t per annum. Freshwater molluscs nei (G2) and Argentine shortfin squid (G3) are the second and third molluscan groups landed in term of quantity. Both the groups have increased in their landing quantity with the passage of time showing a biomass of 263297 t and 336000 t in 2014 correspondingly. The landing of Cuttlefish, bobtail squid nei (G5) has also enormously increased from 1950 (13600 t) to 2014 (137211 t). However, the capture of this group is not reported during the years 1973-1975. Four molluscan groups Cephalopods nei (G4), Jumbo flying squid (G6), Octopuses nei (G7) and various squids nei (G8) have shown continuous capture trend from/after the 1980s with a capture biomass of 43425 t, 332523 t, 121352 t, and 411727 t, correspondingly.

The golden era for fisheries production started in 1978 when economic reforms and open-door policy started in China⁴². For the first time in the history of China, in 1979 new particular legislation viz. Details of Aquatic Resources Reproduction-Protection was

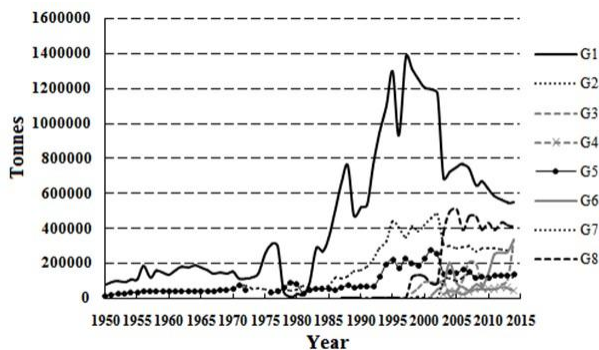


Fig. 5 — Major molluscan groups landed in China 1950-2014. Tonnes.

Source: FAO⁶⁰.

formulated by the National Bureau of Aquatic Products⁴⁷. This legislation was specifically for the fishery exploitation as well as for conservation. This law was actually a modified form of another legislation named Aquatic Resources Reproduction-Protection Regulations which was drafted in 1964. As its name implies, this regulation was aimed to control and manage fishery resources in a sustainable way by observing fishing gears, catch standard, close season and punishment in case of violating the law³⁹.

After the legislation of EEZ, many countries managed their fishery resources by issuing fishery licenses. However, in China, the scenario was different at that time since no license system was present. In 1979, Temporary Regulation on the Issue of Fishery Licences was issued by the National Bureau for Aquatic Products. According to this regulation, adoption of fishery license was mandatory for any fishing enterprise. This licensing system changed the normal ongoing fishery administration and started to effectively control fishery resource utilization. Many fishery components were defined by this licensing system such as target capture of species, duration, and scope of the fishery etc^{39,42}. In the Bohai Sea, aquatic invertebrates were protected through a program. Similarly, aquatic fauna was attempted to protect in the East China Sea and the Yellow Sea as well making agreements with Japan. Use of 600 HP fishing boats was banned. Beside this, in the South China Sea fishery resource protection areas were established such as Zhongsha and Xisha zones³⁹. However, despite these efforts, overall, the situation could not improve significantly⁴².

Thus, the government started to take more measures, the system of production responsibility and deregulation of fishery product prices, to accelerate development in agriculture sector⁴². Although, due to government policy and encouragement in agriculture sector including fisheries sector started to boom but some problems also started. According to the government report in 1979, several fishery resources had collapsed as a result of extensive trawling⁴⁸. In fact, during the early 1980s it had been realized that fishing overcapacity might result in the fishery resource depletion⁴⁹. In 1980, another milestone regarding fishery legislation was achieved when National Bureau of Aquatic Products drafted Fishery Law of the Peoples Republic of China. Several legislative experts with foreign experience and stakeholders were involved in the synthesis of this

law. It came into effect in the same year, 1980, after the approval of the National Congress. Despite this regulation, the government remained unable to control overcapacity. To make this law more effective, the government decided to take strict action in 1983⁴².

Until 1985, despite previous fishery regulations, the fishermen community was able to harvest fishery resources without any proper administration. To check this situation for the sustainable development of the fishery resources, in 1985, the new law “Regulation on the imposition and management of the enhancement and protection fee for shrimp resources of the Yellow Sea and the Bohai Sea” was drafted by the Ministry of Finance and Ministry of Agriculture jointly. Furthermore, in order to effectively control Chinese fishery industry new regulation was drafted viz. method for the imposition of the fishery resources protection fee³⁹.

Post-1980 period has shown extensive growth in the capture production of molluscs. On average 488,863 t of molluscs were landed during this decade. Obviously, this rising production quantity is a result of increased effort in the form of powered boats⁵⁰. During the first half of the 1980s, the huge number of boats had been built. In the pursuit of higher catch quantity, the fishermen increased their efforts which further deteriorated marine resources. Consequently, they start to embrace economic suffering. To check this situation, Ministry of Agriculture issued Administrative Directives for Control of Marine Fishing Vessels. Another historic step in this regard was taken when Chinese central government approved another regulatory document “opinion on controlling the operation of fishing boats in inner sea waters”. This was the first document of its own kind in China³⁹.

Later on, State Council approved details of the fishery law in 1987. This law regulated various aspects of fishery industry such as marine capture strategies, fishery stock augmentation, aquaculture development, and rational fishery resource conservation. This law was the trend setter in Chinese fisheries. A propensity of less exploitation of natural resources and an inclination enhanced production through aquaculture³⁹. Under the ageis of this law, some of its components were omitted and conducive environment encouraged fishermen, thus molluscan capture reached to 957676 t in 1988 for the first time in the history of China. With a capture production of molluscs 687715 t in 1989 China became the largest fish harvester in the world⁴². In accordance with international marine laws and UNCLOS (1982)

during 1997 China signed the agreement with Japan.

Chinese government controlled the increasing number of the fishing boats with the passage of time but fishing effort in the form of kW increased. Statistics have shown that engine power has increased from 11.80 million kW (1998) to 13.72 million (2003). Actually, there existed a shift in the fishing capacity. First shift is from inshore fishing to offshore fishing, then finally to distant water fishing⁵⁰. Overcapacity has resulted in the decreased capture production of fisheries particularly after 2000⁵¹. Molluscan landings are also showing the same picture of decreased production from the beginning of this century.

Export and import of molluscan fisheries in China

Aggregate exports and imports

Reported figures for molluscan trade are from 1984-2013. A pre-1984 era has witnessed very low consumption of aquatic products in China. First two sections mainly explain the development and give an overview of the factors influencing trade regime. From 1950 to 1970, mostly consumers utilized rationed diets deprived of seafood²¹. After hit by the most disastrous famine in 1958, China began to supplement its domestic market through international trade²¹. Hence there started an era of agriculture trade, however, the pace of development remained very slow during pre-reform period. Agriculture sector played a central role in becoming a leading trading nation²¹. Unfortunately, during pre-reform period, a number of government policies worked against the development of agriculture trade such as fixed prices of agricultural goods²³.

Agriculture stagnancy during pre-reform era is usually attributed to two reasons. First, during pre-reform period, various departments of the government took complete control over the agricultural trade including price determination and monitoring every aspect of demand and supply chain^{52,24}. Moreover, in order to meet with food shortage agriculture trade was done²⁹. Agricultural trade was done with a view that it will increase foreign exchange²¹. Second, growth in agricultural export was hindered by the overvalued exchange rate of China²⁸. Even if there were free trade administration, the export would not be possible due to the inadequate domestic supply. Similarly, import would be cheaper and could severely affect local agricultural price market²¹.

Available data on molluscan export (including its products) indicates that export quantity has increased

manifolds from 20,935 t (1984) to 676191 t (2013) (Fig. 6). Although, there are substantial variations during this period, however, the export overall remained on the move. In almost every year, the export quantity increased as compared to the previous year except during 1997 (224052 t), 2003 (388900 t), 2005 (437031 t), 2008 (451513 t), 2009 (451638 t) and 2012 (599838 t). In contrast to export, import showed fluctuating pattern. The period from 1992 to 1998 showed a notable increasing trend in molluscan import. However, after 1998 there started an era of extensive molluscan import. Overall, three import peaks can be observed in the graph at 2000 (244989 t), 2002 (321013 t) and 2008 (416169 t).

China modified its trade through incentive reforms during 1978-1984, and then continued market liberalization during 1985-1990²¹. The period from 1980 to 1990 has witnessed a number of reforms in Chinese trading system. State traders were encouraged to increase the imports. During 1980s domestic market was affected by increasing exports and imports and lower tariff rates. Export and import markets were given more rights and border taxes were reduced. Import tariff gradually decreased with the passage of time i.e. 42.2 % (1992), 23.6% (1998) and 21.0% (2001)⁵³. After about twenty-five years from the onset of the reform period, the intervention of the government in trade had reduced very much liberalizing the market and creating the new horizon for trade. During reform period, agricultural export has superseded import quantity in almost every year⁵⁴. It is very interesting to describe that agriculture trade composition in China has experienced a directional shift in China. For exports, this remarkable shift is from lower to higher valued agricultural products²¹.

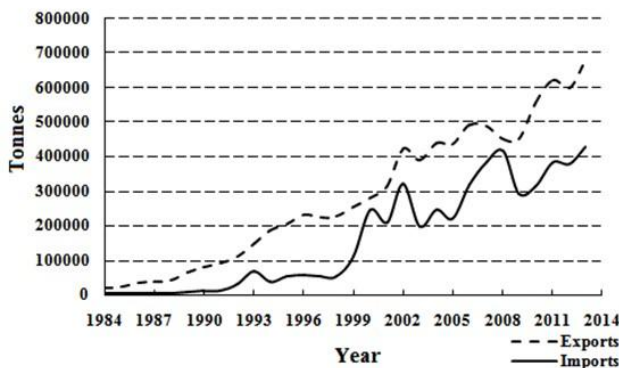


Fig. 6 — Total volume of molluscan exports and imports 1984-2013. Tonnes.
Source: FAO⁶⁰.

Agriculture trade has witnessed an increase of 6%, 1980-2000 in China. This rate has been doubled after 2000 becoming China the greatest importer of agricultural goods³⁷. During the last two decades of the last century, agricultural trade has experienced distortions. These include variation in quota management, the exchange rate of the renminbi, lowered border taxes, and encouragement of private sector by relaxing licensing procedures²⁸. By 2005, the involvement of government in trade was almost absent in many cases²¹. Generally, it is believed that after the accession of World Trade Organization (WTO) China became a great trading country however, in fact its open door policy had started much earlier⁵⁴.

The value of export and import of molluscs is only available from 1984 onwards. Fig. 7 indicates that the value of exports has increased significantly during the period from 1984 (24.543 million USD) to 2013 (4051.175 million USD). Noticeable increase in the value of exports commenced from 1998 (454.985 million USD) to 2009 (1665.898 million USD). From 2010 onwards, the export value of molluscs has rapidly increased from 2465.973 million USD (2010) to 4051.175 million USD with an exceptional increase of 18% per annum.

Chinese fisheries sub-sector has experienced the fastest growth rate of more than 10% per annum through 1980-2000⁵⁵. During 2002, fisheries export earnings had climbed up to 4.7 billion USD. In that year, according to Fisheries Bureau⁵⁶ 13.1 million Chinese inhabitants were engaged with fisheries sector whereas 20.4 million people were dependent on this sector.

Capture fisheries sector has undergone substantial structural changes. In 1970, the value of the structural

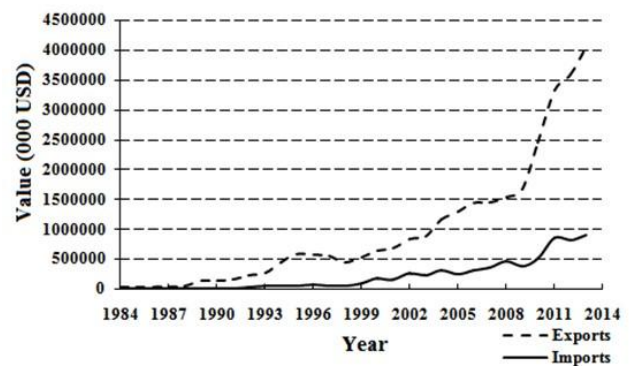


Fig. 7 — Total value of molluscan exports and imports 1984-2013. (000 USD).
Source: FAO⁶⁰.

change in fisheries sector was 74.7%, which gradually decreased and reached 40% in 2000. Fisheries sector has become the largest exported agricultural commodity since 2000 and China is among the fisheries export leading countries⁵⁷. Its export trends are continuously on the move. In 2000, 1.53 million tons of aquatic products were exported which valued 3.83 billion USD. China usually imports low values aquatic species whereas high valued species are exported³⁴. Unfortunately, fisheries sector has received little attention in China. Imports do not have a quota and confer reduced tariffs. It was recommended to diminish tariff of majority aquatic products by 10 to 12% by China’s WTO Protocol of Accession³⁴.

Trading has played a significant role in the economic development of China. Agriculture trade in China during 1980-2000 showed an increase of 6% per annum. This rate has doubled since 2000. China is at position four with respect to the import of agricultural goods³⁷. On the other hand, export has also shown an enormous increase with the passage of time. Agricultural export quantity has almost superseded import quantity during the reform period⁵⁴. The shift in the trade composition has been witnessed with the passage of time. Export volume of horticulture and aquatic goods is gaining increase. This directional trading shift is related to China’s economic privileges⁵⁸.

Exports

The top ten export molluscan products, quantity wise, are graphically represented in Fig. 8. With an average annual export quantity of 89988 t, molluscs and other aquatic invertebrates, prepared or preserved nei (G1) is the most exported commodity during the reported period. Cuttlefish and squid, other than live, fresh or chilled (G2) is the second largest molluscan

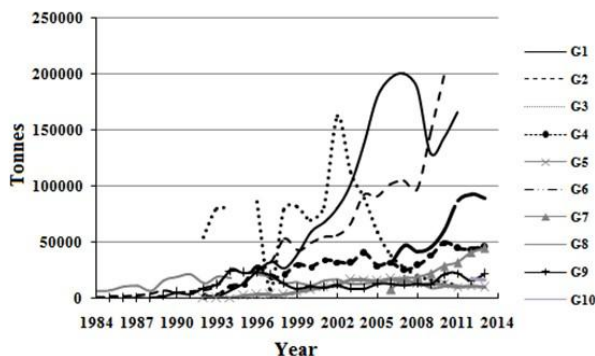


Fig. 8 — Export of main molluscan groups 1984-2013. Tonnes. Source: FAO⁶⁰.

product exported during the course of the study. This is the only category which has shown a continuous export trend from 1984 (1200 t) to 2013 (270272 t). Among exported molluscs categories, in terms of quantity, three categories (Molluscs and other aquatic invertebrates, live, fresh or chilled, nei (G3); Octopus, other than live, fresh or chilled (G4); Octopus, live, fresh or chilled (G10)) started to export from 1992. Whereas, two categories (Clams, shucked or not, live, fresh or chilled (G5); Clams, prepared or preserved, whether or not in airtight containers (G8)) showed the export trend from 2006.

Other two categories of molluscan export (miscellaneous molluscs and aquatic invertebrates other than live, fresh or chilled, nei (G6); scallops, other than live, fresh or chilled (G7)) also showed increasing trend in the export quantity from 6,648 t and 5 t to 11273 t and 21449 t respectively.

With an export value of 1354403 million USD in 2011, molluscs and other aquatic invertebrates, prepared or preserved nei (G1) was the most important export commodity in terms of export value (Fig. 9). Cuttlefish and squid, other than live, fresh or chilled is the second most (G2) important group and is the only group that showed a continuous export trend with an increasing export value from 3,500 million USD (1984) to 1459.129 million USD (2013). Two categories (scallops, other than live, fresh or chilled (G4); Miscellaneous molluscs and aquatic invertebrates other than live, fresh or chilled, nei (G7)) are also the major molluscs groups which have shown more or less export value throughout the reported period. It should be noted that only three groups (cuttlefish and squid, other than live, fresh or chilled (G2); scallops, other than live, fresh or chilled (G4); miscellaneous molluscs and aquatic invertebrates

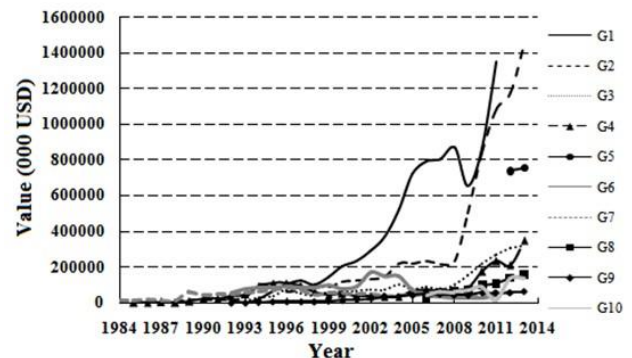


Fig. 9 — Export of main molluscan groups 1984-2013. (000 USD). Source: FAO⁶⁰.

other than live, fresh or chilled, nei (G7)) contributed to export value before 1992. But after 1992, more groups start to add in the export value representing increased earnings through export.

Imports

Molluscan import data is only available from 1984 during post-reform period. Available statistics for import (1984-2013) regarding top 10 molluscan import products are represented in Fig. 10. As a whole, import quantity has increased substantially during the course of the reported time. In 1984, 2000 t of molluscs were imported whereas in 2013 the import quantity has reached up to 410916 t indicating about 200 times increase in import quantity. Cuttlefish and squids, other than live fresh or chilled (G1), the category is the most imported molluscan commodity and only category which has consistently been imported from 1984-2013. The average import quantity of this molluscan commodity remained 128171 t during the study period. From 1992 there started a trend of more import categories. All the remaining categories, except cuttlefish and squid prepared or preserved (G4), were started to import in 1992. cuttlefish and squid, prepared or preserved (G4), were only imported during 2012 and 2013.

Fig. 11 illustrates top 10 commodities with respect to aggregate import expenditure. In terms of import monetary values, Cuttlefish and squid, other than live, fresh or chilled (G1) and Abalones, shucked or not other than live fresh or chilled (G2) were the first and tenth molluscans import commodities. The 2013 import value of the former and later category was 445.921 million USD and 0.984 million USD correspondingly. In addition to these, other six categories (Cuttlefish and squid prepared or

preserved, 113.917 million USD (G6); Molluscs nei. Live, fresh and chilled, 91043 million USD (G8); Scallops other than live, fresh or chilled, 754.44 million USD (G7); Miscellaneous molluscs and aquatic invertebrates other than live, fresh or chilled nei., 70.988 million USD (G5); octopus other than live fresh or chilled, 39.703 million USD (G3); abalones shucked or not live, fresh or chilled, 22.609 million USD (G9) were also contributed to import expenditure this year. However, two groups (molluscs and other aquatic invertebrates live, fresh or chilled nei (G2); molluscs and other aquatic invertebrates prepared or preserved nei. (G4)) did not participate in import expenditure during 2013.

Molluscs consumption in China

According to York and Gossard⁵⁹ economic development is associated with meat and fish consumption. Higher is the economic development rate, more is the animal protein consumption. Consumption depends upon ecological factors, geographical location and cultural trends prevailing in a country. Cultural preferences are usually associated with the local availability of resources. However, due to globalization and trade liberalization, the consumption patterns shall change with the passage of time. In this context, the consumption rate of molluscs in China is on the move corresponding to increasing rate of GDP.

Annual per capita supply of molluscs (1961-2011) is graphically represented in Fig. 12. Consumption data has been reported separately for cephalopods and other molluscs. Pre and post-reform periods show the marked contrast of molluscs consumption in China. Although, the consumption of both the molluscan groups has increased during the course of the reported period, however, the consumption of latter group has

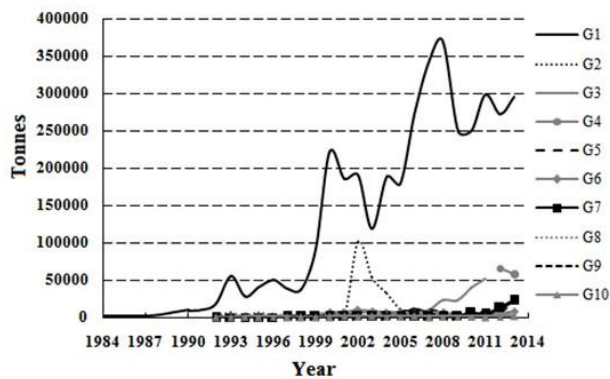


Fig. 10 — Import of main molluscan groups 1984-2013. Tonnes. Source: FAO⁶⁰.

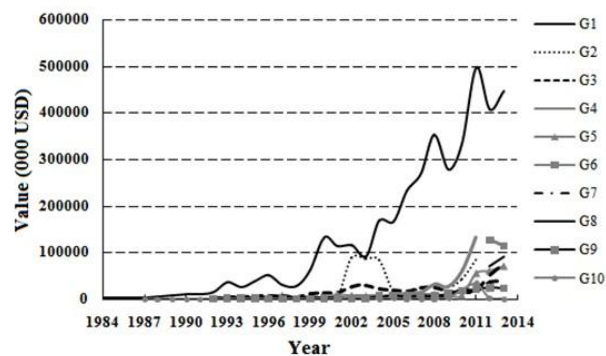


Fig. 11 — Import of main molluscan groups 1984-2013. (000 USD). Source: FAO⁶⁰.

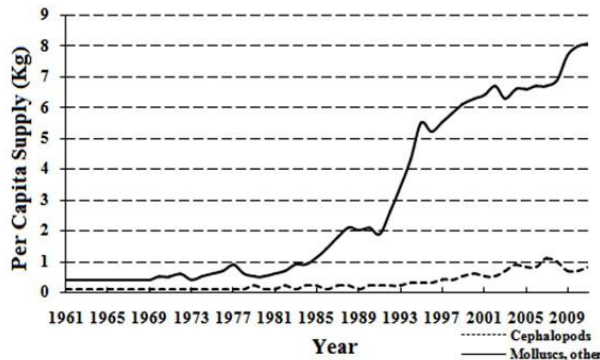


Fig. 12 — Per capita supply of molluscs 1961-2011. Kg.
Source: FAO⁶⁰.

increased many folds. During the pre (up to 1978) and post (from 1979) reform periods average annual per capita supply of both the groups of molluscs remained 0.1 kg/capita/year, 0.49 kg/capita/year and 0.42 kg/capita/year, 4.18 kg/capita/year correspondingly. Starting in 1961, when the annual per capita supply of cephalopods was 0.1 kg its consumption showed a flattering trend. In 2011, its consumption after many crests and troughs reached at 0.8 kg/capita. A single peak of cephalopod consumption representing the highest supply value, 1.1 kg/capita, can be observed during 2007.

For other molluscs group, during post-reform period consumption quantity increased annually by taking leaps. In 1977, per capita supply of other molluscs group was just 0.9 kg, whereas, in 2011 it reached 8.1 kg. The period from 1991 to 1995 showed an abrupt trend in increased per capita supply of other molluscs groups with an average annual supply quantity of 3.54 and annual growth rate of 76.6%. In China, there exists an increasing trend in the export of molluscs and its products. There is a growing concern to control this trade through the establishment of effective fishery policies and making bilateral fishery agreements.

Since independence, the Chinese economy has changed tremendously. The molluscan fisheries sector has also shown substantial changes in landings and trade statistics. The consumption trend of molluscs in China is also increasing with the passage of time. However, change in the origin of supply is witnessed as imports have started to substitute demand for local consumption.

Conclusions

The molluscan landings in China have increased enormously from 1950 (90500 t) to 2014 (2197142 t).

The highest peak of capture production, before 2014, can be observed at 2001 (2131756 t). With a landing value of 551607 t, marine molluscs nei group is the most landed molluscan group. However, overall the capture production of molluscs showed decreasing trend after 2000 due to overexploitation of fishery resources.

Molluscan trade is getting more and more pace as a result of open door policy. Reported figures have shown that since 1984 both export and imports have increased considerably in terms of quantity and value. Molluscs and other aquatic invertebrates prepared or preserved nei is the most exported molluscan commodity group in terms of quantity and value. Whereas, cuttlefish and squid, other than live, fresh or chilled is the most imported molluscan commodity group in terms of quantity and value.

Per capita supply of molluscs is also increasing in China. In 1961, per capita supply of cephalopods and molluscs other group was just 0.1 and 0.4 kg which has significantly increased and reached to 0.8 and 8.1 in that order.

This research work has shown clearly that landings and trade statistics of molluscan fisheries have changed significantly. Consequently, the market composition is changed which may further be investigated through research.

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