

# On Institutional Arrangements of Quota-Based Management for China's Marine Capture Fisheries\*

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## I. Introduction

Marine capture fisheries in China have reached a critical stage. Most, if not all, fish stocks in China seas are fully exploited or even depleted. Moreover, many coastal and inshore fishing grounds of high productivity have disappeared or moved far away from the nation's coastline due to the combined effect of the overexploitation and misuse of marine and coastal resources as well as marine pollution. The harvesting capacity in China's coastal and inshore fisheries continues its increase while it far exceeds levels that are perceived as consistent with sustainable fisheries. As an unavoidable result of the overcapacity of China's marine fishing fleet and the overexploitation of fisheries resources, more and more marine fishing vessels have no longer economically viable.

In view of China's existing management system, it comes no surprise to see this result. The current governance structure of China's fisheries is characterized by a focus on conservation-mined and input-centered control

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mechanism and government-dominated management process. The combination of the command-and-control regime and the common-pool and migratory nature of fisheries resources provides fishermen with weak incentive of conservation and compliance but strong incentive to race for more fish and bypass governmental regulations. The economic signals arising from this institutional framework encourage fishermen to maximize short-term gains, with little conservation motives.

Upon the recognition of the insufficiency of its fisheries governance system, China modified in 2000 its Fisheries Act 1986. The new version of China's Fisheries Act (in Art. 22) says that the nation will determine total allowable catches (TACs) according to the principle of fishing mortality no more than the ability of natural recruitment of fisheries resources and adopts an fisheries governance structure based on the established TACs.

Since the ultimate form of China's quota-based management is still elusive, a question follows: what a strategy is likely the best one for China to balance the subsistent requirement of its huge fishing population, the international competitiveness of its national fishing fleet, and, at the same time, to meet the recreational fishing need of its nationals without threatening the sustainability of its resource base? Bearing this question in mind, we attempt to work out a meaningful institutional framework of quota-based management for China's marine capture fisheries, as will be discussed in this paper.

## II. Developments and Problems of China's Marine Capture Fisheries

Prior to working out a model for quota-based management for China's marine capture fisheries, we have to know what their state is, how they evolve to this state, and what problems they face. In what follows, we will pay attention to these issues.

### 1. Developments of China's Marine Capture Fisheries

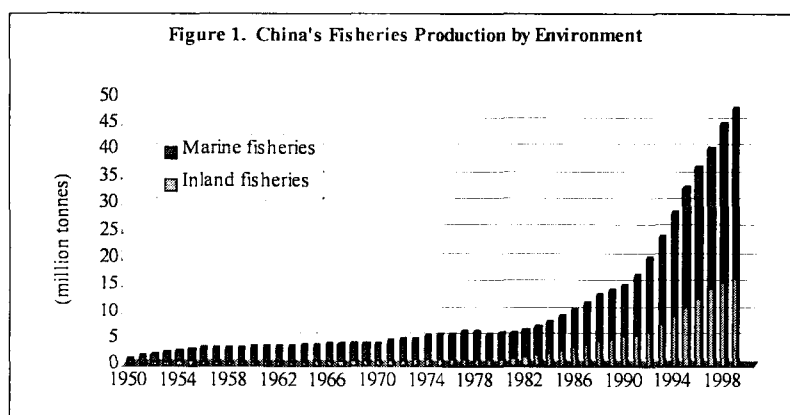
#### *1) Fisheries Production and Consumption in China*

China is one of the oldest fishing nations in the world. Modern archaeological studies indicate that certain types of fishing gear, like the hook and net, were already in existence 6,000 years ago in inland areas where the

early Chinese lived (Zhang *et al.* 1988:9). However, modern history did not see the rapid development of the Chinese fisheries until the late 1970s when the nation determined to reform and open its door to the outside world. The Chinese fisheries have since then entered an era of much faster growth in terms of increase in fisheries production (Fig. 1).<sup>2)</sup>

The rapid increase in fisheries production has made China the first fish producer among all countries in the world since 1989 when it exceeded Japan (FAO 1996). With its reported production of 40.05 million tons in weight (excluding 1.17 million tons of seaweeds production), China accounted for 32 percent of the world total of 125.2 million tons in 1999 (FAO 2000).

Today, China's fisheries is so significant in the global pattern of fisheries activities that, if it is excluded, the per capita fish supply in the rest of the world has actually declined since the mid-1980s (FAO 2000). In contrast, per capita fish supply in China was more than three folded during the same period, increasing from roughly 10.9 kg in 1990 (Mu 1998) to some 33.8 kg in 2000 (Fisheries Bureau, PRC 2001).<sup>3)</sup>



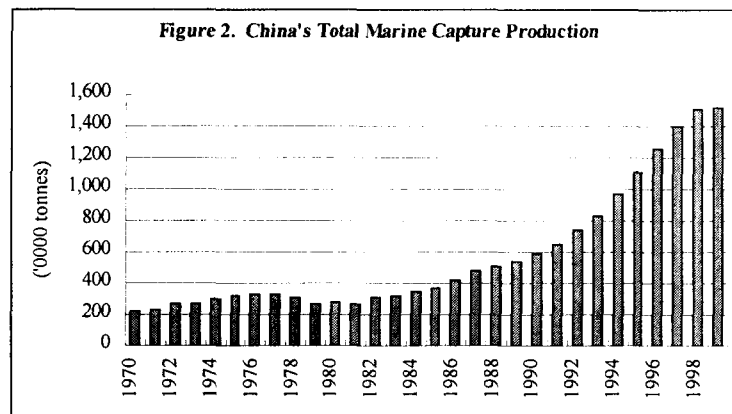
## 2) The Developmental Trend of China's Marine Capture Fisheries

As with its fisheries as a whole, China's marine capture fisheries

2) Unless otherwise specified, data used for figures in this paper comes from FAO's FISHSTAT Plus available online at <<http://www.fao.org/fi/statist/FISOFT/FISHPLUS.asp>>.

3) From a regional perspective, however, the per capita food fish supply in China is still quite low compared to its regional counterparts. For example, the per capita food fish supply is 70 kg, 50 kg, and 55 kg, respectively for Japan, the Republic of Korea, and Hong Kong (a special administrative area of China) (FAO 1996).

demonstrated a strong trend of growth over the last 50 years in the 20th century. Yet the path taken by them is, as shown in Figure 2, never smooth which reflects not only the dynamic process of Chinese political and socioeconomic transformation but change in the focus of national fisheries policy as well (Han *et al.* 1989).



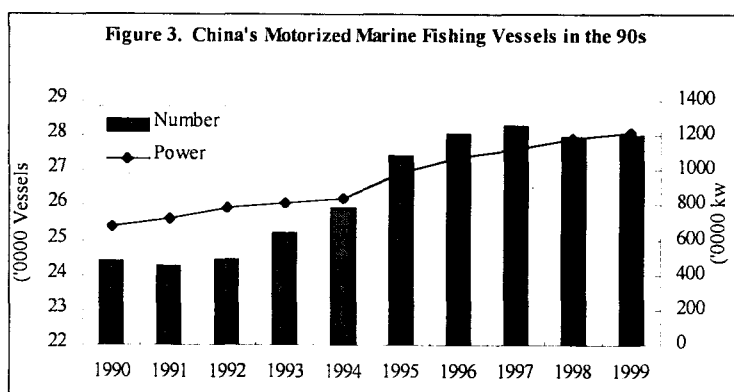
Since the late-70s, a new philosophy for marine fisheries development — protection and rational utilization of inshore resources, actively developing offshore fisheries, and exploring ways to take part in distant water fishing — has been formulated by the government and put into practice. As a result of the implementation of this principle, the range of China's marine fishing fleet has since then expanded to Atlantic and Indian oceans.<sup>4)</sup>

### 3) Motorized Fishing Fleet

Increases in landings from the marine fishing sector have been accompanied by a significant expansion of the nation's fishing effort in terms of increases in the number of motorized fishing boats and their total power. China's marine motorized fishing fleet reached a peak in 1997, numbered at 282,578 vessels and powered by 11,218,739 kw (Fig. 3).<sup>5)</sup> This represents increases of roughly 1.7 times in number and more than 2.5 times in power (Mu 1998).

4) Anon. 1999. *Zhongguo Yuye Wushinian* (China's Fisheries in the Past 50 Years) (in Chinese). Available online at <<http://ifishery.com/zgsc/content9909/03.htm>>.

5) Data used for this figure comes from Mu (1998) and Fisheries Bureau, PRC (1998, 2000, 2001).



From Figure 3, it is clear that China's marine motorized fishing fleet demonstrated a reduction in number after 1997. The total power remains, however, a growing trend, suggesting a tendency of supplementing small-sized boats with larger ones. This phenomenon is due, first, to the result of governmental encouragement to shift fishing effort from inshore to offshore and distant waters and, second, to fishermen's bypass of regulations set by the government to control the number of fishing vessels. It may also imply that the overall level of Chinese fishing equipment and technology is improving.<sup>6)</sup>

On the other hand, as fishing effort continued to increase in the late-70s and the early-80s, landings had declined in the same period due to the reduction in abundance of fish stocks in inshore areas. Over the period from the mid-80s to the late 90s, however, catches increased at an average annual growth rate of 11.22 percent (Mu 1998). This is due largely to increases in landings contributed by the Chinese distant water fleet, the development of new fishing grounds in the South China Sea, and the exploitation of pelagic species in the East China Sea (Mu 1998).

## 2. Structure and Characteristics of China's Marine Capture Fisheries

### 1) Marine Fishing Actors

Marine capture fisheries in China are conducted by state-owned fishing companies, fishing firms under collective ownership, and self-employed

6) From a regional perspective, the Chinese fleet consisted of only 253 vessels of a gross registered tonnage (GRT) over 100 GRT/vessel in 1994, far lower than its regional counterparts of Japan and the republic of Korea, which had 2,423 and 1,012 vessels of over 100 GRT, respectively, in the same year (FAO 1996).

fishermen. In 1982, the state-run fishery enterprises contributed some 20% of the country's total marine fisheries production, producing 530,000 tons of fish (Yu 1991). However, the significance of state-owned companies has been declining in the last two decades. For example, the contribution of state-owned fishery enterprises to the nation's marine fisheries production decreased to 6.91 percent in 1996 (Mu 1998). In contrast, the contribution by the collective sector increased steadily from 2.5 million tons in 1982 (Yu 1991) to 13.37 million tons, up from 80% in 1982 to 93.09% in 1996 (Mu 1998).<sup>7)</sup>

### *2) Composition of China's Fishing Fleet*

The Chinese marine fishing fleet is comprised of 1) trawlers of various sizes (60 percent); 2) gill netters (16 percent); 3) purse seiners (10 percent); 4) hooks and lines (6 percent); and 5) other types of fishing vessels (8 percent) (FAO 1997).

The contribution of various marine fishing modes to the nation's landings has changed over years. For example, trawling and gill-netting operations increased to 46% and 17%, respectively, in 1992 from 36% and 7%, respectively, in 1979; whereas seining and set-netting lowered, respectively, to 6% and 18% in 1992 from 24% for seining in 1979 and 29% for set-netting in 1980. Contribution of landings by other fishing modes was quite low but with some extremes, for example, 33% in 1979 and 30% in both 1981 and 1982 (Mu 1998).

## 3. Socioeconomic Roles of China's Marine Fisheries

Generally speaking, the economic role of fisheries, including both marine and inland fisheries, is of great significance for China simply because of the basic fact that with 7 percent of the world's arable land, China is currently feeding 22% of the global population. By 2000, China's per capita cultivated land has decreased to a level as low as 0.101 ha, only half of the world average.<sup>8)</sup> This reality by itself is serious enough to urge the Chinese government to pay more

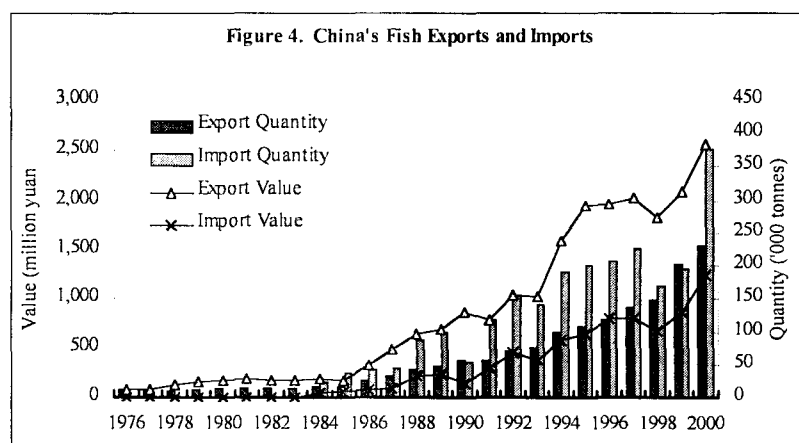
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7) In recent years, the importance of privately-owned fisheries firms seem to increase in a manner similar to that in other economic sectors in China. This is the result of government's existing policies that focus on the use of market mechanisms to sustain growth and the economic dynamism of the rapidly growing private sector (FAO 1997).

8) Xinhuanet, June 5, 2001. "China's Per Capita Cultivated Land Barely Half of World Average" at <<http://news.xinhuanet.com/english/20010605/411590.htm>>.

attention to the sustainable development of fisheries, especially to make full use of wetlands for aquaculture expansion.

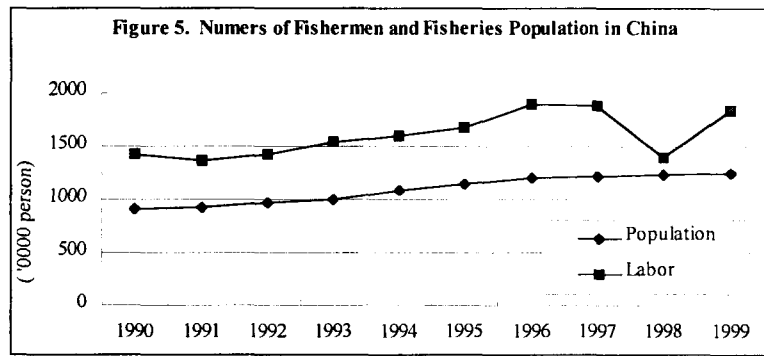
Fish are an important generator of foreign currency for China. The rapid development of China's fisheries has expanded fish exports. Prior to the 80s, the foreign trade volume of fish was only worth about US\$ 300-400 million (FAO 1997). In contrast, the total imports and exports of fish and fishery products in 2000 reached a historical high, amounting to 4.05 million tons in weight and US\$5.68 billion in value (Fig. 4). Of these, exports accounted for some 1.53 million tons, valued at US\$3.83 billion; whereas the volume of imports exceeded 2.52 million tons, with a value of US\$1.85 billion.



Since 1984 (excluding 1999), China has been a net importer of fish and fishery products in terms of volume traded. The dynamics of the increased fish imports result from, *inter alia*, a rising disposable income of the nationals, a huge demand potential in view of a population of nearly 1.3 billion; and the difference in consumer preference. For example, the croaker and the hairtail are the preferred species of the Chinese while the nation's landings are currently unable to fill the gap between demand and supply owing to the limited resource availability. In value terms, however, China has been, and remains, a net exporter so far (Fig. 4).

Fisheries in China are also an important provider of employment, especially for coastal rural areas. There is only fragmentary information on employment in fisheries, but the data available show that during the 1990s, employment in the primary sector (capture fisheries and aquaculture) continued to expand (Fig. 5).<sup>9)</sup>

China's fisheries (including marine and freshwater fisheries) provided jobs for approximately 12.37 million people, supporting a fisheries population of some 19.32 million people in 1998 (Fisheries Bureau, PRC 2000). The Chinese fishery workers account to 34 percent of the world total of 36 million (FAO, 2000). This, in connection with China's share of 32 percent in the world fish production, suggests that the average productivity of China's fish workers is lower than that of the world average.



#### 4. The State of Resources and Ecosystems

##### 1) The State of Resources

Realizing the roles played by fisheries in ensuring food security and providing employment and income, the government had been adopting a policy prior to the 1980s that centered on stimulating the expansion of marine landings through increasing the size, improving fishing technology and upgrading the equipment of the nation's fishing fleet in order to make full use of marine living resources. From the late-50s to the late-70s, however, resource conservation was receiving little, if any, attention. This was due to the misconception that renewable resources were inexhaustible (Han *et al.* 1989). Consequently, marine fisheries resources in China's inshore waters were severely depleted. Overcapitalization and overfishing have become an established fact.

The time-series statistics show that the relative proportions of fish species in China's landings have been dramatically altered. Populations of fish species,

9) Data used for this figure comes from Mu (1998) and Fisheries Bureau, PRC (1998, 2000, 2001).



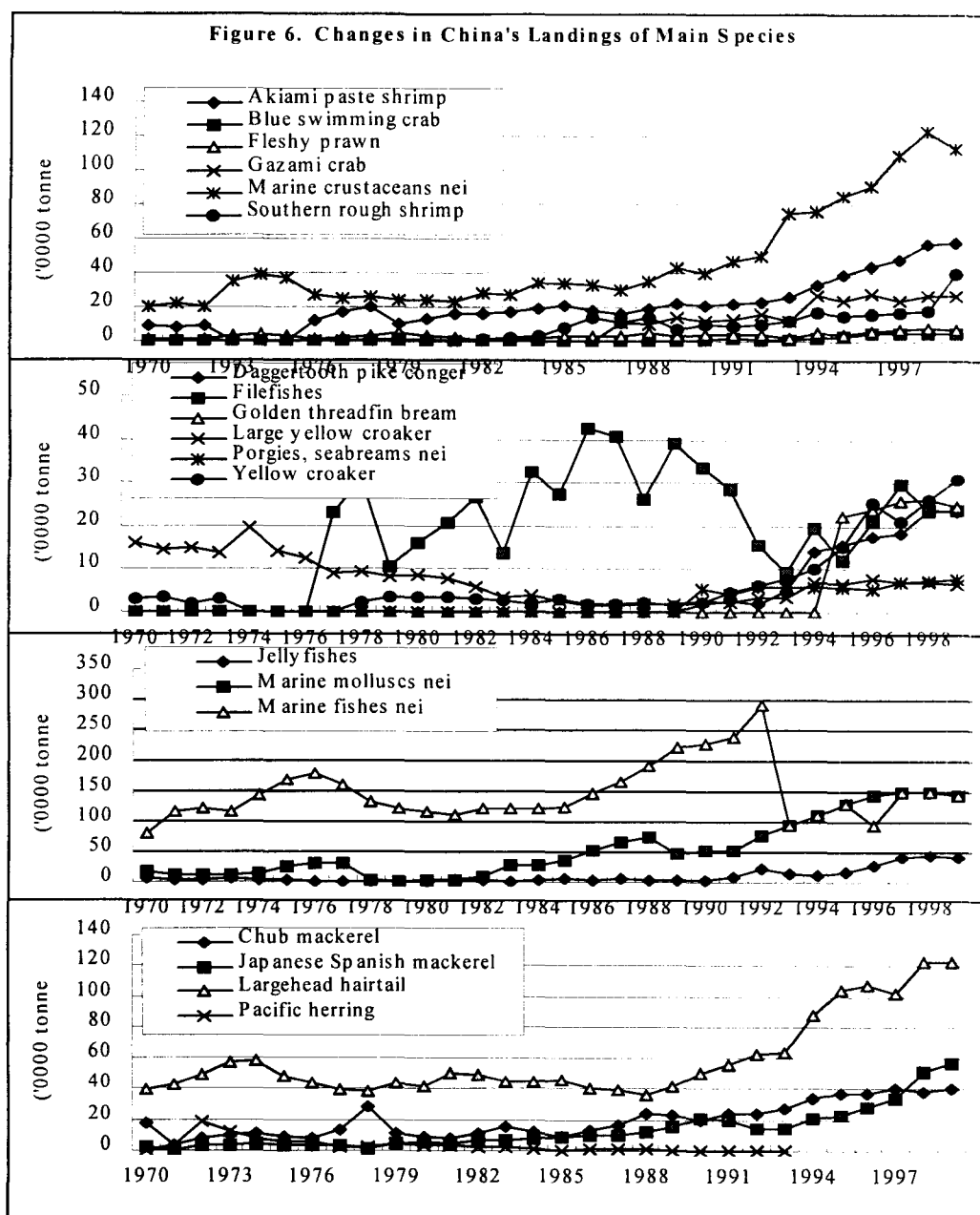
such as the hairtail, the cuttlefish, the great and little yellow croakers that are historically the mainstay of the country's fisheries, have no longer been commercially dominant. With the collapsing of previously dominant species, populations of less abundance or commercial importance have become dominant (Fig. 6). For example, after heavily fishing removals of demersal and larger predatory fishes, Japanese anchovy has taken over as the largest catch in the Yellow Sea. Certain species such as filefish soon become depleted once they are intensively targeted (FMFPSB of the East China Sea *et al.* 1998).

## 2) *The State of Ecosystems*

In addition to the overfishing of individual stocks, the degradation of fisheries habitats has become an increasing concern. Many coastal and inshore fishing grounds of high productivity have lost their fish-producing function or moved seaward far from the nation's coastline due to the combined effect of overexploitation, misuse of marine and coastal resources, and marine pollution. These biological and environmental stresses put at stake the very basis for the future productivity of the nation's marine fisheries (Liu *et al.* 2000).

The most seriously polluted waters are usually in inshore areas, especially waters in bays, surrounding ports and estuaries (Zou 1999). For example, three large grounds of blood clams in the *Bohai* Bay, producing historically an annual production of 300,000 tons (wet weight equivalent), have few clams left now caused by pollution. A well-known fishing ground, *Wanshan Yuchang*, near the Pear River estuary can find no fishing season now (Mu 1998). The *Bohai* Sea, the unique inland sea of the nation, is so severely-polluted that it basically lost its traditional position as the main breeding area for many valuable species such as the Chinese prawn.

As the degree of pollution increases, the occurrence of red tides becomes more and more frequent. For example, the occurrence of red tides increased from 15 in 1999 to 28 times in 2000. China has registered more than 200 red tides in the past decade. A total of 45 large-scale red tides occurred between 1997 and 1999, causing direct economic losses of US\$ 240 million (China Daily, July 14, 2000).



### 5. The Economic Viability of China's Marine Fisheries

As an inevitable result of overcapacity and overexploitation, more and more marine fishing vessels have no longer economically viable. This is especially true for state-owned fishing enterprises, more than half of which have been

suffering from financial losses since 1997 (Fisheries Bureau, PRC 1998, 2000, 2001). In 1999, for example, among the total 2,458 state-owned fishing enterprises, 1,329 firms suffered a financial loss totaled at 0.954 billion *yuan* while the remaining 1,085 firms made a profit of merely 0.52 billion *yuan*, suggesting a net financial loss of 0.434 billion *yuan* (Fisheries Bureau, PRC 2000).

The increase in fishermen's income was, to a large degree, due to increases in fish prices prompted by a robust domestic demand for fish and fishery products and active fish exports in the early and mid-1990s rather than by increases in catches. The occurrence of the Asian financial crisis in 1997 which caused a great shrinkage of China's export markets, along with an inactive domestic market and the rise in the fuel price, substantially decreased the level of fishermen's income in general and threatened the basic livelihood of the marginalized fishermen in particular in the last few years.

The inherent scarcity of fishery resources is compounded by the implementation of bilateral fisheries agreements recently concluded by China with its neighboring countries that are expected to further reduce the fishing availability for China-flagged vessels.<sup>10)</sup> China has recently concluded three bilateral agreements with its neighbors of Japan, South Korea and Viet Nam in the case of the *Beibu* Gulf. Upon the implementation of these agreements with the three countries, the number of Chinese fishermen who have to find jobs elsewhere is expected to be at least 300,000. The livelihood of nearly one million people which depend on those traditional fishing grounds will be affected.<sup>11)</sup> This would not only constrain the economic growth in coastal areas but trigger serious social problems if no alternative jobs were available for those impacted. Furthermore, the fishing vessels retreating from their traditional fishing grounds will inevitably turn to fish inshore or in coastal areas and increase fishing pressure on fish stocks therein which are already under a great stress of overcapitalization.

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10) Consider the fact that China, with a population of nearly 1.3 billion, only possesses a marine water of approximately 300 km<sup>2</sup> in area, even though, some of which are still under dispute (see, for example, Park 2000).

11) People's Daily, April 6, 2001. "Sino-South Korea Fishing Agreement to Take Effect" at <<http://english.peopledaily.com.cn/200104/06/eng20010406-66962.html>>.

### III. The Existing Management System of China's Marine Fisheries

The governance structure of China's marine fisheries is primarily based on the nation's Fisheries Act 1986 and it is characterized by a focus on conservation-minded technical measures, input-centered control mechanism, and government-dominated management process. The combination of command-and-control governance regime and the common-pool and migratory nature of fisheries resources provides fishermen with weak incentive of conservation and compliance but strong incentive to race for fish and bypass governmental regulations, as will be analyzed in the following sections.

#### 1. Public Objectives of China's Marine Fisheries Management

As any economic activities, fisheries generate private and public benefits. The main motive for fishermen to engage in fisheries is of course the sustenance of themselves and their families. Public benefits are: nutritious food at reasonable prices, foreign exchange earnings from fish exports, the provision of employment, and recreational fishing opportunities. The weight attached in government fishery policies to each of these four objectives may varies widely over time, depending on the state of economic development.

According to Neher *et al.* (1989), the early stage of fisheries management is characterize by the objectives that are set for stock conservation and, in some cases, for lessening conflicts between groups of participants for access to fish stocks. This is exactly the current state of fisheries management in China since fisheries management objectives are primarily concerned with the conservation of resources and the avoidance of fishing conflicts in terms of the newly amended Fisheries Act (Art. 1) (SOA, PRC 1990).

Until recently, access to foreign exchange was a major problem for China. This problem is decreasing in severity as more investment capital is becoming available and constraints to its cross border movements lessen. Nevertheless, it is expected that in the long run China needs to export to finance its imports, and export of fish and fish products remains therefore an important policy goal.

The provision of employment opportunity for surplus labor in rural China has been an important function of China's fisheries. This might be a main reason why efficiency is less emphasized by the government. As China emerges in an increasingly globalized world economy, however, inefficiency will be punished

without mercy. Following the entry into the World Trade Organization (WTO), it is expected that efficiency will become a clear policy objective.

## 2. Characteristics of the Existing Management System

### 1) Zoning Regulations<sup>12)</sup>

China employs zoning regulations to facilitate the implementation of fishery policies. Under zoning regulations, China's marine waters are artificially divided into three large zones, i.e. trawler prohibited, offshore and far-offshore zones. The trawler prohibited zone is then divided into provincial and metropolitan zones which are further subdivided into county zones. Superimposed on these zones, special areas are designed to implement special resource protection measures in order to protect fish stocks during wintering, nursery, migratory, or spawning.

The trawler-prohibited zone is bounded by a trawler-prohibited line located at 12 nautical miles from the shoreline (approximately 80 meters in depth). Trawling operations of all kinds are banned in this zone. In the zone, special areas such as feeding and spawning grounds for major species are also specified. Unless otherwise regulated, fisheries activities inside the zone are under the jurisdiction of adjacent provincial (autonomous region or municipality) governments.

The offshore zone is immediately adjacent to the trawler-prohibited zone. The boundaries of the zone are defined by coordinates of longitude and latitude in the East China Sea and by both the coordinates and the water depth in the South China Sea. The *Bohai* Sea and the Yellow Sea are considered inshore fishing grounds.

Waters outside the offshore zone is defined as the far-offshore fishing zone. The management of fishing activities in the offshore and far-offshore zones is under the jurisdiction of the central government.

### 2) Fishing Permit System<sup>13)</sup>

Fishing permit system is the institutional nexus of China's existing

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12) See Articles 3(2), 4 and 5(2) of *Regulations for the Implementation of the Fisheries Law of the Peoples Republic of China* (SOA, PRC 1990).

13) See Articles 15 to 19 of *Regulations for the Implementation of the Fisheries Law of the Peoples Republic of China* (SOA, PRC 1990).

management arrangement, by which the government controls the national fishing capacity, implements fisheries policies, and enforces management regulations. Under this system, a vessel must get a license from the government prior to going fishing. Fishing vessel licenses are issued to individuals, state-owned fishing enterprises and fishing collectives, and the total permitted horsepower must fall under the national quota. With a fishing license, a vessel is authorized to fish in certain zones and areas, employing certain types of fishing gear and methods and to target certain species, as specified in its fishing license.

There are currently three kinds of fishing license, including general, special and temporal licenses. None of the three licenses are transferable and the alteration of conditions prescribed in them is prohibited.

A holder of the general fishing license is eligible to fish specified species within a specified zone by using specified fishing modes. This license is valid for five years, with an annual renewal requirement. The zone specified in this license usually contains one of the three zones as defined above. The holder of a general license can fish with no more than three specified fishing modes, of which setnet operations and trawling cannot be authorized in one license.

A special fishing license is issued to allow a holder to harvest certain protected species in specified seasons and areas, to conduct research and experiments in closed areas and seasons and in protected areas, to catch fish fry and spawners for mariculture and other purposes, and to fish across zones and areas. The special license can be renewed only through reapplication and it is normally valid for a short time period. As with the general license, fishing areas, fishing modes and target species are also indicated in the special license. In the case of catch fish fry and spawners, the license further specifies the authorized operating locations and time, the species targeted and quantities harvested.

A temporary license is issued for vessels which, if allowed to fish, will result in actual fishing capacity in excess of the planned national quota. It is valid for three years. During the 3-year period, the license must be renewed once a year. Like the general and special licenses, the temporary license tells the holder which zones and areas he may fish in, what fishing modes he may take, and what species he may target.

The total number of issued licenses must fall under the national quota. The

national horsepower quota serves as a ceiling for permitted vessels fishing in the trawler prohibited and offshore zones. The national quota is subdivided into provincial or metropolitan quotas which are further divided into county quotas for issuing fishing licenses (see also Wang *et al.* 1992).

### 3) *Measures of Resource Conservation*<sup>14)</sup>

In order to conserve fish stocks and to protect their habitats, a set of management measures have been implemented. These measures are basically the so-called biological methods which include banning certain gears and fishing modes, specifying closed areas and seasons, restrictions on fish and mesh sizes, and by-catch limits.

The banned fishing modes include fishing with electricity, explosives, poisons, cormorants, and "*Qiaoqu*" (a fishing instrument which sounds exceptionally high) are absolutely prohibited. Trawlers cannot operate in the trawler prohibited zone and set-netters are not allowed to fish in offshore and far-offshore zones. Seasonal bans on certain fishing gears are also implemented and the bans are usually associated with the seasonal closures of fishing areas.

Area/seasonal closures are frequently used to protect spawners and juvenile fish. For instance, croakers and hairtail in the Yellow/East China seas are protected by 1) closing *Lusi* fishing ground during their peak spawning season from April 1 to July 31; 2) establishing a hairtail spawning area and banning all fishing activities in this area from May 1 to June 30; and 3) specifying two protected nursery areas where all motorized fishing vessels cannot target the great yellow croaker from August to October.

Rules related to minimum mesh size and fish size and juvenile fish bycatch are also in use in order to allow juvenile fish to spawn at least once. Minimum mesh sizes are set for most fishing gears and modes. For example, the mesh size of trawl cod ends must not be less than 54 mm. Minimum fish sizes are determined with reference to fish length, weight and age at first sexual maturity. Juvenile fish bycatch cannot exceed 20% (in weight) in landings.

### 4) *The Collection of Resource Fees*

China has began to collect resource fees on the marine capture sector which

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14) See Articles 20 to 29 of *Regulations for the Implementation of the Fisheries Law of the Peoples Republic of China* (SOA, PRC 1990).

benefits directly from resource enhancement and protection programs since 1989. The fees are categorized into two groups: the general and the special. The general resource fee is collected from all marine fishing vessels and it is estimated to be appropriately 1-3% of the average value of landings in a three-year period. The special resource fee is imposed on fishing vessels that targeting specifically conserved species such as the Chinese prawn, shrimps, clams, and jellyfish. It ranges from 3% to 5% of the average value of landings in a three-year period. Detailed methods of implementation are subject to individual provinces' regulations.

Proceeds from the fees are used to marine fisheries resource conservation and protection. It is reported that about 30% of the proceeds are used for cost recovery and the rest goes to fund resource propagation and enhancement programs (Mu 1998).

#### *5) Monitoring, Control and Surveillance (MCS)*

The monitoring, control and surveillance (MCS) system in China is confined to the enforcement of the fisheries management regulations in compliance with the Fisheries Act of the country. It is operated at the various levels of fisheries administrative agencies. At the central government level, the Fisheries Bureau is in charge of implementing the system. At the regional level, the Fisheries Bureau has three branch offices of fisheries management and fishing superintendence set up for the three sea areas, i.e. the Yellow and Bohai Seas; the East China Sea, and the South China Sea. At the local level (municipal, county, etc.), there are more than 1,500 fisheries management and fishing port superintendence units including fishing boat inspection units in operation.

The main function of the Government in this respect are to 1) protect fishery resources and environment of the fishing areas; 2) preserve rare and endangered species of living aquatic resources; 3) keep fishing operations in order; 4) protect fishing rights and interests of the country and its fishermen; 5) supervise and manage fishing ports and navigation safety; 6) settle fishery-related disputes; 7) facilitate communication with fishing vessels; and 8) provide technical inspection of the fishing vessels (FAO 1997).



### 3. Institutional Constraints of the Existing Management System

Compatibility of individual incentives and public interests is a key factor for the success of institutions. The importance of incentive compatibility can hardly be overstated. The motive to serve one's own interests before anything else is a strong one in human beings. The ability to bend administrative orders, manipulate information, etc., while having in principle to obey instructions from above, is often great. Hence, administrative orders that run counter to individuals self interests will often accomplish little, compared with systems in which individual interests and that of the society are served by the same type of action.

Unfortunately, the common feature of fisheries tools currently used by China is that they, in general, do not come to grip with the fundamental problems of fishermen's incentive of "race for fish". As a result, they may realize the objective of biological conservation but can by no means prevent the dissipation of rent and make the fisheries economically efficient. To confirm this argument, let us consider the characteristics the existing management arrangements as follows:

- At the core of the current system is the fishing licensing system that is supported by zoning regulations;
- Management measures are basically based on biologists' proposals such as gear restrictions, size and sex limits, and 3) area/season closures;
- The monitoring, control and surveillance system typifies itself as a command-and-control regime where fisheries administration is conducted by governments at various levels, with little participation of fishermen in the process. There are few institutionalized forums where small-scale fishers can effectively express themselves, and in few cases where they are empowered to influence fisheries policies in any decisive way.

In addition, the existing management framework within which fisheries operate is complex and vulnerable to failure. The absence of clearly defined property rights, the trade-offs between national and local needs and the impact of rising pressures on resources can all lead to management failures. Under such an institutional context, it comes no surprise that China's marine fisheries are trapped into a crisis stage.

#### 4. Perceived Necessity for a Quota-Based Management Arrangements

The superficial glance of China's marine fisheries production often gives the impression of health associated with almost continuous growth of the harvest experienced since the early 1950s. However, the seeming robustness of fisheries activities can by no means mask the reality that China's marine capture fisheries are under great stress. The twin threats of overfishing and the degradation of marine ecosystems put at stake the very basis for the future productivity of the nation's marine fisheries.

Upon the recognition of the nation's harvesting capacity far exceeding the level perceived as consistent with sustainable fisheries, the central government has taken a tight control on increases both in the number and in the capacity of fishing vessels (the so-called "dual control" mechanism) but little positive result has been realized. This is conceived by some domestic scholars and fisheries bureaucrats as a combined effect of three interrelated kinds of factor such as 1) the inadequacy of management arrangements and fragmented fisheries administration, the shortage of enforcement capacity, the bureaucrats' corruption behaviors, and the pervasive local protectionism; 2) the comparative advantage of fishing as opposed to farming, and the lack of alternative job opportunity in coastal rural areas which is compounded by the ongoing rush-in of labors from inland to coastal areas; and 3) the noncompliance with management regulations by rent-seeking fishermen and, especially, the unchecked illegal fishing activities.

The above pessimistic scenario shows strikingly a crisis in China's marine capture fisheries. Consequently, how to achieve a sustainable development of China's marine fisheries has come to surface as one of the nation-wide hot topics (SOA, PRC 1996). In response to this issue, the Chinese government has initiated a series of measures including, most notably, 1) the establishment of an aquaculture-centered developmental strategy and a policy of encouraging the development of distant-water fishery; 2) the freezing of fishing capacity at the level of the late 1990s through a "dual-control" mechanism, 3) the set-up of a "zero-growth" target for marine capture fisheries in 1998, 4) the extension of area/seasonal closures to cover all seas under the nation's jurisdiction; 5) the strict check of illegal fishing activities, and, most recently, 5) the modification in 2000 of the nation's Fisheries Law 1986, which makes a quota-based

fisheries management legitimized.

In an effort to reduce fishing effort to a more efficient and sustainable level, China's fisheries management agencies have traditionally relied on input controls, such as limits on the number of boats that can operate in a fishery, on boat capacity and on the amount and types of gear used. However, the implementation of input controls is often followed by increases in effort and investment with the substitution of unconstrained for constrained inputs, and technological improvements to inputs. This is because input controls do not provide incentives for the removal of excess capacity.

This broad background information reveals, however, partially the dynamics driving China to add a quota-based regime to its fisheries management toolbox. The political, economic, and social logics behind China's resort to the market-based output controls may be interpreted as 1) politically, the ratification of the United Nations Convention on the Law of the Sea (UNCLOS) in 1996 and the establishment of the nation's Exclusive Economic Zone (EEZ), the temporal settlement of a long-lasting ideological debate in respect to whether or not a "socialists system" is compatible with a market mechanism (Wang 1994), the conclusions of bilateral fisheries arrangements with Japan, Korea, and Vietnam, and the establishment of sustainable development strategy; 2) economically, the increasing scarcity of available resources, the need to earn foreign currency, the gaining of the WTO membership, the contribution of fisheries to the nation's GDP growth; and 3) socially, considerations related to employment, food security, and coastal fishing communities' stability and the ease of increasingly acute conflicts among fishing participants and between fishermen and other users of the marine space.

#### **IV. Modeling Quota-Based Management for China's Marine Capture Fisheries**

Both theoretical analysis and fisheries management experience show that the key to an effective governance system is to eliminate the incentives to race for fish (Andersen 1986; Cunningham *et al.* 1985; Hannesson 1993; OECD 1997). To do this effectively, the governance system must manage to change a *de facto* open-access resource to a closed one. ITQ-based management has the

potential to achieve this purpose (Lee 1999). With a right to a share in the fishery, the incentive is to maximize economic benefits by reducing the cost of using one's right and/or increasing the value of right, for example, by producing a higher quality fish product. In view of these advantages, the model proposed for China's quota based management is primarily based on ITQs.

However, all policy and management, in fisheries or any other sector, involves trade-offs. Achieving the goals of increased overall economic efficiency, more effective enforcement or administration, or more effective conservation through the use of ITQs may lead to the reduction in the number of fishermen and other shifts in the distribution of benefits from the fishery. Moreover, fisheries management institution do not originate in an institutional vacuum. To survive throughout history, it must be perceived as legitimate and need to fit into its environment. Bearing these issues in mind, we attempt to provide a meaningful conceptual framework of quota-based management for China's marine capture fisheries, as described in the following sections.

## 1. Criteria of the Proposed Model

Any institutional reform must obtain the support of an overwhelming part of interested groups if such reform is to be successful. There are some unique features in the Chinese setting which need to be kept in mind.<sup>17)</sup> Compared with other jurisdictions, the huge population in coastal fishing villages creates a unique challenge to China in the transition to a quota-based management system. In the course of China's transition to quota-based management, any proposed institutional arrangements must be able to ensure the basic survival need of fishermen and their dependents. It follows naturally that China, in designing its institutional arrangements for a quota-based management, must first find a flexible solution to ensuring the majority of its fishing population will become better off or, at least, not worse off. Without a flexible solution to this issue, any institutions are doomed to be a failure even if they serves wonderfully to other considerations.

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17) Any mechanical copies of ITQs may prove a disaster. China must consider its special conditions. This is because two types of rules of the game can be identified: formal ones (constitutional, property-rights rules, and contracts) and informal ones (norms and customs). Then, even if good formal rules are borrowed from abroad, since local informal rules are inert and difficult to change, a tension may be created between the two. As a result, a borrowed institution may be neither enforceable nor functional.

The transition of China's marine capture fisheries to a quota-based management can be seen as a shift among three broad institutional orders: community, market and state. The three contrasting institutional orders are reflected in each of the three dominant models of fisheries management. The state model corresponds to the centralized and bureaucratic form of management that presently forms the basis for China's fisheries management. While dominant, however, its ineffectiveness is explicit. Hence, models drawing on the two other institutional orders are suggested as solutions. The ITQ model seeks to address the inefficiencies of the state-centered model by establishing clearly defined property rights to allow the market to function. On the other hand, the model of co-management seeks to incorporate user-groups into management process in order to increase the legitimacy of resource regulations (Kim 1996).

These three models have different features and suggest very different solutions to fisheries problems and carry different redistribution implications. The state model attempts to control fishing effort at a reasonable level in order to avoid resource depletion. The market model emphasizes efficiency, taking overcapacity, underdevelopment and inefficient allocation of resources as a primary concern. The community model pays attention specifically to issues of equity and legitimacy.

Each of the three models has a distinct capacity for distribution. In a market, redistribution will happen in accordance with principles of efficiency (Park 1998). Actors able to exploit the most efficient strategies will gain control over resources. Access to capital and information is generally skewed in favor of the rich; it seems unlikely that the market principle will work in favor of the disadvantaged groups. According to the community principle, redistribution should take place in favor of the small, local and traditional participants. Relying on the community model could undermine the big companies in favor of the coastal population. The governance structures of the state emphasize control over distribution and redistribution. To the extent the state is captured by organized interests, the capacity for redistribution will decrease.

The type of, and capacity for, redistribution is hence a question of choice of institutional arrangements. We argue that for maintaining a sustainable marine capture fisheries, China has to address the following issues simultaneously. These include the sustainability of the resource base and environment, social

stability and livelihood security of the coastal fishing community, economic efficiency and international competitiveness of the industry, and institutional compatibility with the land tenure system in rural China. Taking resource sustainability as a premise, decision makers have to balance economic efficiency against distributive equity. Based on this thinking, we propose a mixed strategy to address the multiple objectives that must be balanced in designing institutional arrangements for China's marine capture fisheries.

## 2. The Division of TAFVCs, TARC and TACCs

The participants of marine capture fisheries in China may be broadly categorized into three distinct groups. They are 1) small-scale subsistent fishermen, 2) recreational fishermen, and 3) commercial fishermen. In the first group are participants engaged in small-scale coastal and inshore fisheries. They normally reside in coastal fishing villages, use small-sized fishing boats, motored or non-motored, and fish for subsistent need. Currently, most fishing activities in China is undertaken by small vessels operating close to the shore from numerous landing ports, using a wide variety of fishing gear and techniques. The fisheries tend to be multi-species and close inshore. In many fisheries, fishing trips are limited to few hours. For this sector, the idea of individual rights to fisheries is not feasible, given the poor state of the resource, the large number of fishermen dependent on the resource, and the numerous landing points fishing vessels call. The lack of capacity of governments to enforce property rights is also an impediment for moving towards individual property rights in small-scale fisheries. Therefore, for small-scale fisheries in China, the allocation of quota shares to individual participants may prove to be impossible.

Belongings to the second group are participants who fish for recreational rather than for subsistent or commercial needs. Experience gained elsewhere shows that it is important to incorporate recreational sector of a fishery into management framework from the inception of management programs (Bess 1999; Campbell *et al.* 2000). Up to date, however, recreational fishing in China has not yet been incorporated into any regulatory regimes. The economic importance and impacts on resources of this sector have not been assessed. It is imaginable that as the nation's population increases, so does the burden

placed on fisheries resources by the sector.

The last group includes fishing enterprises under state or collective ownership and private owners of big-sized fishing vessels. Participants in this group usually fish offshore and/or in high seas, with a clear commercial purpose. Compared with fisheries-advanced nations, commercial fishing sector is less developed and usually poorly equipped. Taking into consideration the huge population in China and the depleted state of coastal and inshore fisheries resources, this sector should improve its efficiency and international competitiveness in order to gain a greater share of international fisheries resources. In addition to government assistance by using financial leverage, the model suggests that this sector should be governed by market instruments.

Bearing these issues in mind, we suggest that national TACs first divided by three seas, i.e. the *Bohai*/Yellow Seas, the East China Sea, and the South China Sea. The TAC of a particular fish stock is then allocated to individual municipalities or counties which are adjacent to waters where the stock occurs. A municipality or county TAC is then divided into Total Allowable Fishing Village Catches (TAFVCs), Total Allowable Recreational Catches (TARCs), and Total Allowable Commercial Catches (TACCs) in case that the species is targeted by all the three groups. If a fish stock is traditionally targeted not by all the three groups, the TAC will be allocated only to the group(s) that targets the stock. If the great yellow croaker is only targeted by commercial fishermen, for example, the TAC will become the anonymous of TACC.

The allocation of national TACs to TAFVCs, TARCs and TACCs should follow a principle of small-scale subsistent fisheries first. That is, a reasonable amount of TACs should be set aside to ensure the basic survival need of coastal fishing villagers. This is because for small-scale subsistent fishermen in coastal communities, fisheries resources are actually means land for rural farmers. Therefore, the government policy for these fishermen should be in consistency with its policy for farmers. On the other hand, the recreational need of the nationals cannot be compromised because they are collectively the ultimate owner of fisheries resources and, therefore, their legitimate rights in fishing have to be satisfied. It follows immediately that, where the TAC of a fish species is not sufficiently abundant to support both commercial and non-commercial needs, preference will be given to the non-commercial fishing. This means reasonable shares of the national TACs should be reserved for

TAFVCs and TARC, after the reduction of which, the remainder goes to TACCs.

### 3. Definitions of IFVQs, IRCQs and ITCQs

#### *1) Individual Fishing Village Quotas (IFVQs)*

The total allowable fishing village catches (TAFVCs) represent the portion of national TACs reserved to meet the survival and development needs of coastal fishing villages that depend historically on marine fishing activities. TAFVCs will be divided into many quota shares which will be assigned to individual fishing villages through administrative procedures according to criteria predetermined. A quota share gained by an individual fishing village is referred to as an Individual Fishing Village Quota (ITVQ).

An individual fishing village quota shares most of the characteristics of ITQs except that there are additional constraints attached to it. IFVQs should have a legal basis and the condition attached to an IFVQ is that it legally must remain in the village. To be consistent with the existing land tenure system in rural China, an IFVQ should be defined as a revocable privilege durable as long as 30 years.<sup>16)</sup> It permits a fishing village that holds IFVQs to catch a proportion of the total allowable catch for a fish stock.

A village may be free to decide how to harvest its quota share. For example, it may lease its quota share to individual villagers or temporarily to other fishing villages for fees. It can also use the quota for recreational purpose if no relative laws and regulations are violated. No matter what decision a village may make, however, the nature of collective ownership cannot be changed.

The collective ownership of IFVQs has additional implications. The huge fishing population in traditional fishing villages constitutes a single largest challenge for China to implement a quota-based management. First, social stability would likely be threatened by inequity issue if quotas were simply allocated to individuals or individual groups. Second, it is unlikely to be a

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16) One experience gained internationally is, and theoretical analysis also shows, that initial entitlements of quota share should be long enough to increase holders' incentive to conserve resources and encourage long-term investment. This, together with an intention to make our model consistent with the existing land tenure system in rural China, initial entitlements of quota share are defined for a period of 30 years. Modification can be made on a 10-year basis by using the Australian "drop-through" system to offer possibilities for subsequent reallocation of quota shares in response to changing circumstances (Tietenberg 2000).



feasible strategy because the amount of quota gained by an individual would be too small to achieve any economies of scale and scope of fishing operations. Moreover, continuous demographic movements may lead some fishing communities to be overcrowded while others may become bankrupt over time. This has indeed occurred in Iceland since the implementation of ITQs programs (Eythórsson 2000).

*2) Individual Recreational Company Quotas (IRCQs)*

An IRCQ is defined as a share of total allowable recreational catches (TARCs) that is allocated to a recreational fishing company under whatever private, collective, or state ownership, depending on the nature of the company itself. IRCQs will be allocated by auction. A company that is qualified in terms of predetermined criteria will be authorized to conduct recreational fishing business once it succeeds in bidding for a share of TARCs in an auction. The competitive bidding process is similar to the allocation of total allowable commercial catches (TACCs), as will be discussed later.

IRCQs aim to incorporate this sector into the unified institutional framework based on quota-based management. For this purpose, those who wish to go recreational fishing must become the member of at least one recreational fishing company and must abide by rules prescribed by the company. A recreational fishing company should be responsible for its members who violate governmental regulations.

As with IFVQs, the quota share owned by a recreational fishing company represents a revocable privilege which may be valid for at least a 30-year period. A recreational fishing company may chose to permanently sell or temporally lease its quota share to other companies of similar nature in the same region. Inter-sector and cross-region transformation of quota shares would be prohibited. It is necessary to set maximal and minimal on quota share that may be hold by a particular recreational fishing company.

The conception of individual recreational company quotas is a novel idea. Currently, there are few precedents worldwide to integrate a recreational fishery into quota-based management systems. This is because recreational fishermen generally are great in number, cross many economic classes, and thus vary greatly with respect to economic investment in fishing. They also tend to be spread over a wide geographic area and land their catch at a

variety of locations, potentially making quota monitoring a formidable problem. By mobilizing civil society to organize recreational participants and participate in the management process, the institution of IRCQs may serve as a feasible solution in China.

*3) Individual Transferable Commercial Quotas (ITCQs)*

An individual transferable commercial quota is defined as a share of total allowable commercial catches (TACCs). As with IRCQs, TACCs will also be allocated by auction. An individual fisherman or a fishing enterprise qualified to own such quotas may attend the bidding for a share of TACCs. Once becoming a successful bidder, a fishermen or a firm will become an owner of ITCQs.

As with IFVQs and IRCQs, ITCQs are also defined as a revocable privilege with a 30-year duration. An owner may permanently sell, or temporally lease, his quota share in the marketplace. There may be restrictions on cross-region and/or -fleet transfer of quota share. Limits on maximal and minimal holding of quota share may need in place. To prevent monopoly, aggregation of quota share at the hands of a small number of owners should be prevented.

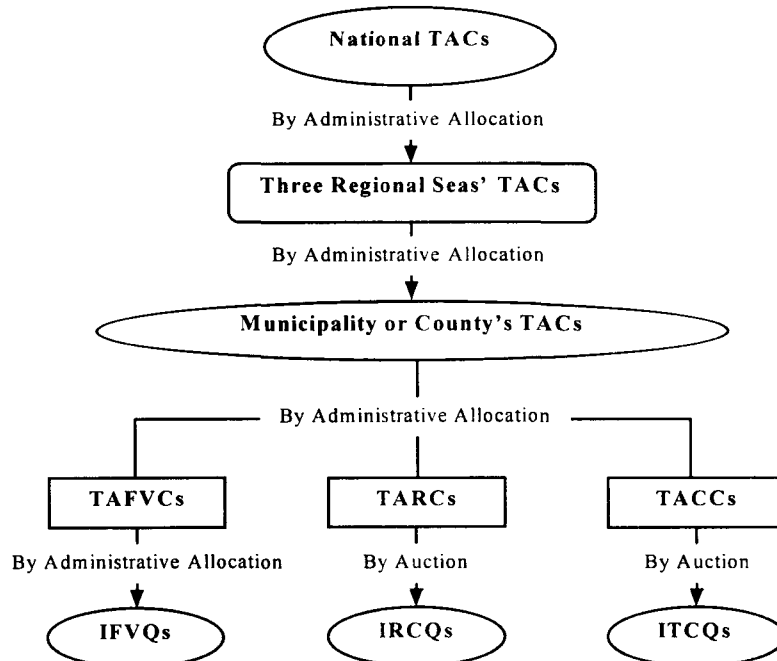


Figure 7. The Schematic Illustration of the Proposed Model

#### 4. The Integration of the Model

With the largest fishing population in the world, China is faced with a huge challenge in implementing a quota-based management. To address this issue, we have identified three groups of fishing participants in developing the model of quota-based management for China's marine capture fisheries. They are 1) residents in fishing villages that are engaged in small-scale fishing operations for subsistent need, 2) recreational fishing participants, and 3) fishermen who fish for commercial purpose. To integrate the three groups into a unified institutional framework, we suggest that national TACs should first be divided into TAFVCs, TARC and TACCs. TAFVCs, TARC and TACCs are then broken into IFVQs, IRCQs and ITCQs. These components are schematically illustrated in Figure 7.

Table 1 Characteristics of IFVQs, IRCQs and ITCQs

	<b>IFVQs</b>	<b>IRCQs</b>	<b>ITCQs</b>
<b>Role</b>	As land for farmers to meet villagers' survival need and village development	As a kind of recreational facilities to meet nationals' recreational need	As a kind mine resources for users to make profits
<b>Purpose</b>	Maintaining the social stability of traditional fishing villages	Utilizing the social force to organize and manage recreational fishermen	Improving economic efficiency of the commercial fishing sector
<b>Ownership</b>	Collective	Private, collective, or state, depending on owners' nature	Private, collective, or state, depending on owners' nature
<b>Initial allocation</b>	Administrative	Auction	Auction
<b>Durability</b>	30 years	30 years	30 years
<b>Transferability</b>	Cannot be sold out; temporal intra-sectoral lease is allowed	Full intra-sector/region transferability	Full intra-sector/region transferability; inter-region transferability may or may not be allowed depending on species
<b>Quotas concentration</b>	A fixed share of TACs	With maximal and minimal limits	With maximal and minimal limits
<b>Compliance regime</b>	Collective liability; administered by government and villages jointly	A recreational companies shall be responsible for violators who have its membership	Whatever that are feasible; long-term objective is to set up a co-management regime between users and government

IFVQs, IRCQs and ITCQs are devised as a mechanism to balance the trade-off between social equity and economic efficiency. They have distinctive characteristics and serve different purposes. How to maintain the stability of traditional fishing villages and to meet the survival needs of their residents constitute the biggest challenge for China to implement quota-based management. IFVQs are considered as a viable solution to this challenge. Recreational participants in China are currently not subject to formal regulations. As the livelihood of the Chinese nationals improves, fishing likely becomes an important recreational activity in the near future. Experience gained elsewhere shows when launching an ITQs-based management program, it is important to take into account recreational fishing from the inception of the program. That is why IRCQs are proposed. Once issues associated with small-scale subsistent fishermen and recreational fishing participants are settled, improving economic efficiency of the commercial fishing sector should become a clear policy objective. ITCQs, as a market-based instrument, have a clear institutional advantage to improve economic efficiency and, thus, are proposed to the commercial fishing sector. Main characteristics of IFVQs, IRCQs and ITCQs are summarized in Table 1.

It should be noted that IFVQs and IRCQs may be considered as ways of delegating some management responsibilities and authorities. An important condition attached to IFVQs is the clause of collective liability. In enjoying the collective ownership of fishing quotas, fishing villages have to take the collective liability if a violation is detected whether it is an individual or collective behavior. This is expected to be an effective strategy to check the prevalence of illegal fishing in China, most of which is fishing village-based. On the other hand, it is important to made recreational fishing companies discipline their members. For the management of ITCQs, participants in large-scale commercial fisheries should be structured into fishermen cooperatives (e.g. in Korea and Japan) or producers organizations (e.g., in Western Europe) by areas, fleet, or types of fishing gear to facilitate the implementation of co-management by government and industry (Choe 1998).

## V. Conclusions

In this paper, we have 1) investigated the developmental process of, and

problems encountered by, China's marine fisheries over the last 50 years in the 20th century; 2) analyzed the existing management system of China's fisheries and its institutional deficiencies; and 3) proposed a conceptual framework of quota-based management for China's marine capture fisheries. The main results from this study are summarized as follows.

First, China's marine fisheries over the 1990s continued a strong trend of growth, as have maintained since the early 1950s, when the civil war of the nation came to an end, and speeded since the late 1970s which saw the nation launching two catching-eye movements of reforming its economy and opening its door to the outside world. However, the seeming robustness of fisheries activities can by no means mask the reality that China's marine capture fisheries are under great stress. The twin threats of overfishing and the degradation of marine ecosystems put at stake the very basis for the future productivity of the nation's marine fisheries.

Second, the current governance structure of China's fisheries is characterized by a focus on conservation-mined technical measures, input-centered control mechanism, and government-dominated management process. The combination of the command-and-control regime and the common-pool and migratory nature of fisheries resources provides fishermen with weak incentive of conservation and compliance but strong incentive to race for more fish and bypass governmental regulations. The absence of clearly defined property rights and lack of users' participation in management process can all lead to management failures.

Third, in response to this issue, the Chinese government has initiated a series of measures including, most notably, 1) the establishment of an aquaculture-centered developmental strategy and a policy of encouraging the development of distant-water fishery; 2) the freezing of fishing capacity at the level of the late 1990s through a "dual-control" mechanism, 3) the set-up of a "zero-growth" target for marine capture fisheries in 1998, 4) the extension of area/seasonal closures to cover all seas under the nation's jurisdiction; 5) the strict check of illegal fishing activities, and, most recently, 5) the modification in 2000 of the nation's Fisheries Law 1986, which makes a quota-based fisheries management legitimized.

Fourth, compared with other jurisdictions, the huge population in coastal fishing villages creates a unique challenge to China in the transition to a

quota-based management system. In designing its institutional arrangements for a quota-based management, therefore, China must first be able to ensure that this sector will become better off or, at least, not worse off. On the other hand, experience gained elsewhere shows that when implemented an ITQs-based management program, it is important to take into account recreational fishing from the inception of the program.

Bearing in mind all the issues mentioned above, we have identified three groups of fishing participants in developing the model of quota-based management for China's marine capture fisheries. We suggest that national TACs should first be divided into total allowable fishing village catches (TAFVCs), total allowable recreational company catches (TARCs) and total allowable commercial catches (TACCs). TAFVCs, TARCs and TACCs are then broken into individual fishing villages quotas (IFVQs), individual recreational company quotas (IRCQs) and individual transferable commercial quotas (ITCQs).

It should be noted the proposed model is mainly based on theoretical analysis and lessons gained by other countries. To be adopted, a more detailed study should be conducted by a team of multidisciplinary experts in relation to feasibility issues and details of implementation. Moreover, the experimental research should be made in sites with varying social and economic settings prior to the formal adoption of this model.

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## 쿼터제에 基礎한 中國沿近海 漁業管理에 대한 制度的 研究

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### 요 약

이 논문은 2002년도 부경대학교 수산경영학과 박사학위논문(A Study on Institutional Arrangements for Quota-Based Management : The Case of China's Marine Capture Fisheries)의 일부이다. 이 논문의 기본목적은 쿼터제에 기초한 중국의 어업관리를 위한 제도적인 틀을 세우고자 하는데 있으며, 이런 목적을 달성하기 위해 이 논문은 다음과 같이 구성하여 연구를 진행시켰다.

제1장은 연구목적과 문제의 제기에 이어 제2장에서는 중국 해양어업의 개발과 이에 따른 문제점을 분석하였으며, 여기에서 쿼터제에 기초한 어업관리정책의 제도적 제안을 함과 동시에, 제3장에서는 중국 해양어업의 현실과 중국 사회의 일반적인 현상을 분석하여 제4장을 통해 쿼터제에 기초한 중국의 어업관리를 위한 제도적 프레임워크를 제안하였다. 마지막으로 본 논문을 요약하고 향후 계속되어야 할 연구과제를 제시하였다.

본 논문의 중요한 연구 결과는 다음과 같다.

현재 중국 수산업의 관리체제는 질적 규제 중심 관리제도, 그리고 정부 주도하의 어업 관리 과정으로 특징지을 수 있다. 이러한 명령과 통제 (command-and-control) 방식의 전통적인 중국어업 관리제도로서는 어업인들에게 있어서 자원 보존에 대한 동기와 제도에 대한 수용성을 약화시키며, 정부 규제를 오히려 무시하게 되는 결과를 초래한다. 결과적으로 현행 중국의 어업관리제도는 어업인에게 있어서 자원 보존에 대한 유인을 약화시키고 단기적인 수익을 극대화하도록 유도하는 맹점을 지니므로 인해 더 이상 지속적인 어업성립의 보장을 할 수 없다는 점을 지적할 수 있다.

중국정부는 이러한 어업관리제도의 불완전성을 인식하여 2000년 10월 31일에 1986년에 제정된 수산업법을 개정하게 되었으며, 새로운 중국의 수산업법은 어업 허가제도와 함께 할당량제에 기초한 어업관리제도를 국가가 운영하는 것으로 특징지을 수 있다. 그러나 아직까지 중국은 할당제에 근거한 어업관리제도를 미실시중에 있으며, 그 내용도 애매모호한 점을 많이 가지고 있다. 또한 중국의 절대적 어획량은 현재 논란의 여지로 남아있고, 거대 어업 인구의 근본적인 요구와 중국 어선의 국제적인 경쟁력, 그리고 유어(遊漁)에 대한 사회적 요구 등도 중국의 수산정책이 채결해야 할 과제이다.

위에서 고찰한 내용을 기초로 하여 우리는 중국의 쿼터제에 기초한 어업관리에 대해 다음과 같은 몇 가지를 제안한다.

중국 연근해어업에 있어서 할당제 모형에 참가하는 어업 참여자들의 유형은 세 가지로 구분할 수 있다. 첫째는 어촌에 거주하면서 생존수단으로 소규모 어업에 종사하는 경우이고, 둘째는 유어어업의 경우이며, 셋째는 상업적 목적으로 어업에 종사하는 집단으로

나눌 수 있다. 이러한 세 집단을 하나의 제도의 틀로 통합하기 위해서는 국가의 총허용 어획량(TAC)을 총 어촌 허용어획량(TAFVCs)과 총 허용 유어 어획량(TARCs) 및 총 허용 상업적 어획량 (TACCs)의 세부분으로 나눌 것을 제안한다. 그리하여 다시 TAFVCs와 TARCs, 그리고 TACCs는 어촌별 어획량(IFVQs), 개별 유어 회사별 어획량(IRCQs), 그리고 양도 가능한 개별 상업적 어획량(ITCQs)으로 나누어 관리하도록 한다. 이와 같이 중국의 국가 총허용어획량(TAC)을 IFVQs와 IRCQS, 그리고 ITQCQs의 세부분으로 구분하여 할당하고, 여기에 기초하여 어업을 관리하는 것은 중국에 있어서 사회적 형평성과 경제적 효율성과의 상충관계를 고려하여 고안된 것으로, 중국에 있어서 수산업을 통한 경제적 및 사회적 효과를 동시에 기대할 수 있을 것이다.

Key Words : China's Marine Capture Fisheries, Quota-Based Management, Total Allowable Catches (TACs)