

# New Policy Paradigms For Korean Fisheries' Transition To Responsible Practices

SEONG K. PARK  
JEONG G. RYU  
Korea Maritime Institute

## Introduction

Changes in perceptions of fisheries development and ocean environmental issues have occurred gradually, but steadily, with the active support of governments. Since the 1987 report of the World Commission on Environment and Development (the Bruntland Report), the vast majority of world governments have officially agreed that there is an urgent need for policies to promote more sustainable, responsible forms of fishery development. So have most international organizations, including the specialized agencies of the UN, as well as a large number of world fishing communities. At the 1992 Conference on Environment and Development (the Earth Summit), leaders from all of these bodies endorsed Agenda 21, a series of common goals and measures to that end (Johnson 1993).

In recent years, there have been several important changes under which Korean fishing industries must operate. Such changes include joining the Organization for Economic Cooperation and Development (OECD), introduction of Exclusive Economic Zones (EEZs) in Northeast waters, the internationally adopted principle for responsible fisheries, and Early Voluntary Trade Liberalization (EVTL) of fish and fish products at the Asia-Pacific Economic Cooperation (APEC). A series of recent events is expected to make inevitable a wider structural change of Korean fisheries in compliance with new international fishery regimes and compelling domestic problems.

The Korean government and fishing industries started to pay closer attention to issues, such as: the economic impact of responsible fisheries on production and management, the impact of fisheries resource sustainability on government financial transfers, implications of post-harvest practices on responsible fishing, and social implications of responsible fisheries. These issues, in fact, have interrelationships which require new fisheries policy.

Korea has long operated a conventional fishery management regime (CFMR) which includes gear restrictions, closed seasons and closed areas, limited entry, *etc.*, but social problems and post-harvest practices have been largely ignored. In spite of sophisticated legal arrangements, the Korean CFMR seems to have made little progress toward adjusting itself to new fishery environments and alleviating over-capitalization problems.

New international orders and standing problems surrounding Korean fisheries

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Seong K. Park and Jeong G. Ryu are researchers at the Korea Maritime Institute, Fisheries Economics Research Division, Korea Maritime Institute 154-10, Samsung-dong, Kangnam-gu, Seoul, Korea 135-090, e-mail: [skpark@suji.kmi.re.kr](mailto:skpark@suji.kmi.re.kr) and [jkryu@suji.kmi.re.kr](mailto:jkryu@suji.kmi.re.kr), respectively.

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suggest that Korea shift its fishery policy from the CFMR to a new paradigm with emphasis on resource sustainability and responsible fishing activities.<sup>1</sup>

The main objectives of this paper are to: (i) describe the profile of Korean fisheries, (ii) investigate changing fisheries regimes, (iii) analyze current and future issues, and (iv) draw policy implications.

## Profile of the Korean Fisheries

### *Government Policies*

*Resource Management.* Fishery resource management in Korea involves two levels of government; *i.e.*, the central government, Ministry of Maritime Affairs and Fisheries, and local governments at provincial, city, and district levels. Korean law of fisheries, fishery resource protection legislation, and legislation relating to EEZs provide the legal framework for management of the fisheries sector and protection of fishery resources. During the past fifty years, fishery resources have been managed mainly through regulations governing mesh size, catch size, fishing grounds, fishing seasons, and other command and control instruments.

In spite of past resource management efforts based on the control of production methods and inputs, continually depleting fishery resources in coastal waters (particularly economically important species such as yellow croaker, other croaker species, and hairtail), have called for better management of fisheries resources in Korean waters.<sup>2</sup> As implementation of Article 61 of the United Nations Convention on the Law of the Sea (UNCLOS) is inevitable, in 1997 the government prepared to amend the rules and regulations to facilitate practice of the total allowable catch (TAC) system. To implement a TAC system, the government revised the Law of Fisheries (1995) and the Fishery Resources Protection Ordinance (1996); revised statistical reporting systems for coastal and deep-sea fisheries (1997), covering ten fisheries; and set the TAC rules (1998).

Quotas are allocated through the TAC Committee and the Central Fisheries Coordination Committee, which are composed of academics and professionals from business and other sectors. Under the TAC system, priority will be given to species requiring conservation measures or species with unusually high landings (*i.e.*, squid).

In addition, the government declared sovereign right in the Korean EEZ (announced in 1996) and its enforcement (announced in 1997). This law covers regulations relating to monitoring and control of foreign fishing vessels and special rules relating to keeping fishing orders. Enforcement legislation and regulation deal with: establishment of special zones where fishing by foreign vessels is prohibited; assessment of collateral and methods of payment; fishing permits and approval of experimental research, including application procedures; and administration of fishing vessels that violate fishing rules and regulations.

*Government Financial Support.* In 1997, total financial support to the fishery sector was 950 billion won, 100 billion won more than 1996. The coastal fisheries received

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<sup>1</sup> Fisheries sustainability is defined as the use of marine living resources in an environmentally acceptable manner. Responsible fisheries is conceptualized as measures of supporting fisheries sustainability, following principles and international standards of behavior for responsible practices with a view to ensuring the effective conservation, management, and development of living aquatic resources, with due respect for the ecosystem and biodiversity (FAO 1995, "The Code of Conduct for Responsible Fisheries.")

<sup>2</sup> CPUE (catch per unit effort, GT) of overall adjacent fisheries has continued to decline for the last two decades: 4.7 mt, 1975; 3.4 mt, 1990; 3.2 mt, 1995.

835 billion won (85 billion won more than 1996), and the distant-water fishing sector received 835 billion won (15 billion won over 1996). At present, financial support is provided in the form of loans which have lower than market interest rates to encourage new, and stabilize current, fishing operations. To prevent preference toward a particular sector, basis for financial support is determined by the scale of the fishing operation.

To drive structural improvement of agricultural and fishing villages, loans worth 219.2 billion won were granted to develop shrimp farming salt ponds and improve management of fishermen's cooperatives. In addition, financial support was provided to improve and modernize fish processing and culture facilities for exporting live fish and to facilitate structural adjustment of coastal fisheries, develop mariculture, and establish market and fishing facilities.

*Structural Adjustment.* Structural adjustment of the fishery sector, originating from the special law for agricultural and fishing village development legislated in 1990, has been carried out based on *A Study on Structural Adjustment of On- and Off-Shore Fisheries* (Park et al. 1992).

Reduction of fishing capacity has been an integral part of government policy for structural adjustment of the fisheries sector since 1994. In 1997, 135 fishing vessels were retired, 48 coastal and 87 offshore. Capacity reduction was aimed mainly at nonviable fishing industries due to loss of fishing grounds resulting from the declaration of EEZs by other coastal countries. Eight fishing industries (e.g., large purse seines, offshore stow net, offshore angling, trawls, etc.) are included in this program.

## Capture Fisheries

### *Employment and Fleet Structure*

In 1997, the total number of households involved in marine fisheries was about 102,000, a decrease of 1.7% over 1996. Women employed in the fisheries sector comprised 46.5% of the total, a 2.7% increase over 1996. The number of fishermen older than 50 years slightly increased to 55.8% in 1997, from 55.6% in 1996.

The number of fishing vessels in 1997 was 74,287, which is a 7% increase from 1996. Other than vessels of 100–149.9 GT, all categories of fishing boats increased in 1997 over 1996. In particular, powerboats less than 25 GT showed the most significant expansion.

### *Landings and Fish Stock Status*

In 1997, quantity and value of capture fishery harvests, consisting of coastal and distant-water fisheries, was slightly reduced from the previous year. Ten important species of coastal fisheries were: Alaska pollack (*Theragra chalcogramma*), hairtail (*Trichiurus lepturus*), yellow croaker (*Larimichthys polyactis*), mackerel (*Scomber japonicus*), anchovy (*Engraulis japonica*), sardine (*Sardinops melanoostictus*), sole (*Peltorbamphus novaezeelandiae*), leatherjacket (*Parika scaber*), arrow squid (*Nototodarus sloanii*), and cuttlefish (*Sepia esculenta*). Of these, production of Alaska pollack, sardine, leatherjacket, and cuttlefish declined to 10% of the 1985 level, but catch of squid, anchovy, and mackerel increased considerably. Increasing exploitation of species with a one-year life cycle, such as squid, is a very unusual phenomenon. Since 1995, Korea has recorded annual increases of squid production by some 70,000 mt.

In spite of difficulties with distant-water fisheries, production from the deep-sea fishing industries (*e.g.*, tuna and squid fishing, and the trawl fisheries) has shown an increase of 260,000 mt over 1996. This drastic increase of squid catch, by both coastal and deep-sea fishing industries, caused a significant drop in market price, thus necessitating a large amount of government purchase.

In terms of catch volume, the coastal fisheries did not show unusual changes during the last three years. The CPUE (catch per unit effort, GT) has remained at 3.2–3.7 mt. However, the ratio of juvenile fish in the catch shows an increasing trend, suggesting depletion of resources, particularly species such as: hairtail, yellow croaker, sardine, and cuttlefish. In addition, the volume of pollack catch has declined.

There is also a clear indication of depletion of high-value species. At the same time, abundance of typical pelagic fish species, such as squid, has been confirmed. The only clear change in the status of coastal fishery resources is that squid, traditionally caught in the East Sea, is now abundant in all coastal waters.

### *Bilateral Agreement and Arrangements*

The Northeast seas (*i.e.*, the East Sea, Yellow Sea, and East China Sea) that are exploited by Japan, China, Korea, DPRK, and Russia, are known to be very productive areas. However, management of resources in these waters has been complicated due to territorial claims made by China, Japan, and Korea. In 1997, Japan and China signed a new fishing agreement, revising the fishing agreements signed in August 1975.

Korea and Japan signed the existing fishery treaty in June 1965. In view of changing fishing conditions in the Northeast Asian seas that resulted from the implementation of UNCLOS, which came into force in November 1994, the two countries began negotiations to revise the existing treaty. Fishery negotiations between Korea and Japan have been difficult and complicated due to territorial claim to Dock-do and historical background.

During negotiations in 1997, Japan unilaterally declared establishment of straight base lines in the East Japan Sea, disregarding the provisional clause of the Article 1 of the Korea-Japan Fishery Treaty.<sup>3</sup> Japan's action resulted in serious conflicts between the two countries. However, the two neighboring coastal states were able to promote mutual understanding through more than seventeen negotiation talks.

As a result, on September 24, 1998, Korea and Japan reached a conclusion of the complicated negotiations. Under the agreement, Korea and Japan will have exclusive fishing zones extending thirty-five miles from their coasts, and a joint fishing area, which stretches from 131.66 to 135.5 degrees east longitude. Negotiations centered on a fishing area known as "Taehwato" to Korea and "Yamatotai" to Japan, which is located between 135 and 136 degrees east longitude.<sup>4</sup>

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<sup>3</sup> In the case that one treaty country establishes a fishing zone using the straight base line, it shall be determined in consultation with the other treaty country.

<sup>4</sup> Both Korean and Japanese fishermen call the zone a "golden" fishing area, where they catch 20,000 tons of squid annually. In a half-line compromise, the Korean and Japanese delegations to the Tokyo talks finally agreed to include half the squid fishing ground in the joint fishing area whose eastern limit is drawn at 135.5 degrees east longitude. Both states also agreed, in principle, to put a limit on catches to conserve marine resources in the joint fishing area. To this end, Korea and Japan agreed to set up a joint fisheries committee to work out concrete measures. Operations by fishing boats will be regulated by their own state. Under the new accord, Japan will provide grace periods ranging from one to three years for Korea, during which Korean fishermen will be allowed to operate in waters beyond 135.5 degrees east longitude and off Japan's thirty-five-mile exclusive zone. After the new accord takes effect, Korean fishermen will be allowed to catch pollack for one year, large crabs for two years, and other fish for three years in the waters near Japan (*Donga Ilbo*, and *Korea Herald*, September 26, 1998).

## **Mariculture and the Environment**

Aquaculture production increased to 1,015 thousand mt in 1997, up from 875 thousand mt in 1996. Out of the total mariculture volume in 1997, finfish, shellfish, seaweed, and others accounted for 2.8%, 36.7%, 56%, and 4.5%, respectively. Its value in 1997 reached 0.92 billion won, a significant increase over 0.64 billion won in 1996.

In spite of the increase in production volume and value, declining product quality has been noted, due mainly to deteriorating environmental conditions at aquafarms. This necessitated adoption of environmentally sound farm management and farming methods. The government introduced coastal aquaculture maintenance programs consisting of the following components.

### *General Mariculture Ground Maintenance (1986)*

Target: Sea culture farms propagating bottom species, such as shellfish and seaweed, as well as nurseries and seedling production facilities.

Contents: Sediment management, culture methods, treatment of waste and discharge, removal of abandoned gears.

### *Special Mariculture Ground Maintenance (1996)*

Target: Sea culture farms suffering from frequent failure, including occurrence of red tides (nine special zones).

Contents: Total environmental improvement, including relocation of farms and clean up of culture ground.

### *Demonstration Mariculture Ground Maintenance (1994)*

Target: Old farms, particularly those with low productivity due to many years of continuous use and/or outbreaks of disease.

Contents: Improvement of farm environment, relocation/rearrangement of farms, and installation of appropriate facilities.

Total funds invested in general culture farm maintenance (total of 23,000 ha), demonstration farm management (800 ha), and special farm maintenance (2 zones) were 20.8 billion won in 1997. The benefits of the coastal aquaculture maintenance programs were clearly demonstrated by regeneration of aquatic microorganisms and increased productivity, as well as improved product quality.

## **Distribution and Sanitary**

Total supply (production + import + remainder from the previous year) and consumption (domestic + export + carryover to next year) of fishery products in 1997 was 4,860,000 mt, an increase of 40,000 mt from 1996. Supply and demand showed that domestic consumption and imports declined 0.5% and 1.3%, respectively. Domestic production remained at the same level as that of 1996, and exports increased 0.2%.

Scheduled production of fish and fisheries products is difficult due to the nature of fisheries (*e.g.*, quick spoilage, dependence on season, and one-time mass catch), and this difficulty often makes market prices unstable. To ensure stable market prices, the government established the Price Stabilization Fund for agricultural and

fishery products. This government reserve fund is intended to cover ten items, including seaweed, frozen squid, and frozen hairtail. It should be noted that due to overproduction of squid, the government purchased 27,417 mt (a 575% increase over 1996), worth 32,223 million won (a 453% increase over 1996).

Improvement of the fishery marketing system centered around expansion of market facilities, improvement of the consignment system at landing sites, and improvement in distribution capacity at large consumption areas. Expansion of consignment facilities at landing sites and wholesale fish markets, establishment of a distribution and processing complex at Kamcheon port in Pusan, and expansion of waste and discharge treatment facilities have been accomplished.

As of October 1997, the government completely liberalized the consignment system at landing sites that had been part of the two-stage free market system since 1996. To strengthen distribution and handling capacity at consumption sites (*i.e.*, reduction of distribution and handling steps and marketing margins) and promote direct shipping to consumers through fishermen's cooperatives, five direct-sale market facilities have been established at large urban areas where mass fish consumption takes place.

To ensure safety of fishery products and harmonization seafood safety standards with international standards, the government revised the enforcement regulations for seafood inspection (August 1997), revised seafood standards (August 1997), and announced HACCP (Hazard Analysis and Critical Control Point) for fish meat (December 1997).

## Consumption and Trade

Consumption of fishery products has increased since 1991, and per capita consumption in 1997 reached 45 kg. Habit persistence of Korean people is 0.5 kg in comparison with maximum 1.0 kg for high-demand species such as squid, yellow croaker, and hairtail. In addition, demand for seafood in Korea was inelastic in price, but elastic in income (Park and Jeong 1994).

The pattern of seafood consumption, influenced by increasing personal income and changes in eating habits, showed that consumers tend to place increasing importance on safety, convenience, and nutritional value. Market conditions affected by changing consumption patterns and the open-market system, prompted further attention to be given to selective production of fish and fish products and seafood safety.

Korea exported US\$1,493 million of fish and fish products in 1997, a decrease of 8.7% over 1996. During the same period, Korea imported US\$1,045 million, a decrease of 3.3% over 1996. Major export species were tuna, fish cake, squid, and arkshell. Main import species were Alaska pollack, shrimp, seasoned squid, yellow croaker, and hairtail.

With the implementation of GATT (General Agreements on Tariffs and Trade)/BOP (balance of payments) agreed upon in October 1989, Korea removed the import restrictions on thirty-one items on 1 July 1997. Thus, Korea has opened its entire market of fish and fish products for all 390 items specified in the guideline of HSK (Harmonized System Korea).

At the same time, Korea relaxed regulations on export restrictions. It abolished the export promotion system applied to the eight items, including fresh and frozen sole and eel, that was intended to prevent overcompetition among fishing households.

## Changing Fisheries Environments

### *International Orders of Responsible Fisheries*

In 1983, UNCLOS adopted a framework for the better management of marine resources. The new legal regime of the oceans gave coastal states rights and responsibilities for the management and use of fishery resources within their EEZs, which account for some 90% of the world's marine fisheries (FAO 1993, 1996).

In recent years, world fisheries have become a dynamic sector of the food industry, and coastal states have striven to take advantage of new opportunities by investing in modern fishing fleets and processing factories in response to growing international demand for fish and fishery products. It became clear, however, that many fisheries resources could not sustain the current rate of exploitation.

Clear signs of overexploitation of most fish stocks, modification of ecosystems, significant economic losses, and international conflicts regarding management and fish trade threatened the long-term sustainability of fisheries and the contribution of fisheries to food supply (see Matthiasson 1996). Therefore, the 19th session of the FAO Committee on Fisheries, held in March 1991, recommended that new approaches to fisheries management embracing conservation and environmental, social, and economic considerations were urgently needed (Ministry of Maritime and Fisheries Affairs 1998).

In May 1992, Mexico, in collaboration with FAO, organized an International Conference on Responsible Fishing in Cancun. The Declaration of Cancun endorsed at that conference was brought to the attention of the Earth Summit (United Nations Conference on Environment and Development) in June 1992. The Summit supported the preparation of a Code of Conduct for Responsible Fisheries, which placed priority on high-seas fisheries—particularly preventing reflagging of fishing vessels which affect conservation and management measures on the high seas.

The Code was formulated so as to be interpreted and applied in conformity with relevant rules of international law, as reflected in the 1982 UNCLOS, as well as with the Agreement of the Implementation of the Provisions of the UNCLOS of 10 December 1982. This relates to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks in 1995 and in light of *inter alia*, the 1992 Declaration of Cancun, the 1992 Rio Declaration on Environment and Development (in particular, Chapter 17 of Agenda 21).

The Code of Conduct consists of five introductory articles: Nature and Scope; Objectives; Relationship with Other International Instruments; Implementation; Monitoring and Updating; and Special Requirements of Developing Countries. These introductory articles are followed by an article on General Principles which precedes the six thematic articles on: Fisheries Management, Fishing Operations, Aquaculture Development, Integration of Fisheries into Coastal Area Management, Post-Harvest Practices and Trade, and Fisheries Research. An integral part of the Code is the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas.

It appears that the Code is voluntary. Certain parts, however, are based on relevant rules of international law, as reflected in the UNCLOS. The Code also contains provisions that may be or have already been given binding effect by means of other obligatory legal instruments among the parties, such as the Agreement to Promote Compliance with the 1993 Conservation and Management Measures by Fishing Vessels on the High Seas.

## Government Financial Transfers

Today, many fishery experts and international fishery organizations perceive that ineffective management is a fundamental obstacle to fisheries sustainability, and this problem has not yet been dealt with successfully, or at all, in the vast majority of countries, including most of the large fishing nations.

It tends to be compounded by the increasingly obvious fact that governments not only undermanage the fishery sector, but also play a countervailing role as providers of perverse economic incentives. Subsidies are an unfortunate byproduct, or even symptom, of ineffective management. Thus, a serious analytical task is to examine the relationship between ineffective management and government-funded and directed economic incentives in the fisheries sector (FAO 1993).

In the latter half of the 1980s, negotiations on agriculture and shipbuilding resulted in much stricter and more comprehensive rules for subsidies. However, the fisheries sector was excluded. The 1994 Uruguay Round Agreement on Agriculture excluded fisheries products from its scope. The OECD Shipbuilding Agreement exempted fishing vessels and was not even ratified by all the signatories. It, therefore, did not go into effect. As a result, rules governing the use of subsidies in the fisheries sector are the only provisions in the WTO's basic subsidies agreement—the Agreement on Subsidies and Countervailing Measures (USTR 1994).

The 1994 WTO Subsidies Agreement represents a significant improvement in the rules and disciplines governing both the use of subsidies and countervailing measures to offset their effects. The international rules that govern subsidy issues are fairly recent. The 1994 WTO Subsidies Agreement would be a logical starting point in addressing subsidy problems to better understand the specific roles, impact, and WTO legal status of fisheries sector subsidies (Milazzo 1998).

The OECD Fisheries Committee, at the 79th session in April 1997, agreed to study government financial transfers (subsidies) that affect the transition to responsible fisheries. A method was also agreed upon for a study that involves member countries submitting information on government financial transfers, levels of fishing capacity and activity, and fish stock status.<sup>5</sup> In fact, government policies and programs, in most cases, lead to government financial transfers that can affect fishing capacity and international trade. In turn, fish stock status and international trade can be affected by fishing capacity and activity.

At the 81st session of the OECD Fisheries Committee in March 1998, Norway provided a case study. This study showed interesting results (OECD 1998). The greatest support was granted in the early 1980s, with diminishing allowances in the following years. In 1996, government financial transfers were almost zero. Since 1982, fishing capacity (*i.e.*, the number of fishing vessels) and the number of fishermen have gradually decreased, and total biomass has drastically increased from that of 1988.

## Early Voluntary Trade Liberalization of Fish and Fish Products

APEC has begun a trade liberalization process among its eighteen member countries, which is a major regional initiative. APEC trade liberalization is consistent with the WTO, but it differs in some ways from the GATT/WTO multilateral process and the free trade areas (Pangestu 1997).

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<sup>5</sup> OECD Fisheries Committee, "Impact on Fisheries Resource Sustainability of Government Financial Transfers," 1997. This document describes the information required from Member countries on government financial transfers. This issue was discussed at the 80th Session of the Committee for Fisheries (6–8 October 1997).

In 1994, the Bogor Declaration set the ambitious target of achieving free and open trade in the region by 2010 and 2020. In 1995, the Osaka Action Agenda (OAA) provided guidelines for implementing policy measures to reach this target. In 1996, APEC leaders adopted the Manila Action Plan for APEC (MAPA), in which all APEC members submitted their individual action plans (IAPs) to be implemented in 1997 and afterwards. Submitting IAPs was a voluntary, unilateral measure, which is rarely found within any other international economic cooperation bodies.

The OAA has comprehensive coverage of fifteen areas (*i.e.*, fishery products, fibers, *etc.*), including both border and domestic measures. Liberalization commitments take different forms between areas. The eighteen APEC members differ greatly in their current level of impediments to trade and investment. Although all members started liberalization simultaneously in 1998, two tracks are set, one for developed members finishing by 2010, and the other for developing members finishing by 2020.

It has set a unique modality based on unilateral announcement of liberalization commitments by individual members. This modality is very consistent with economic principles and ideals, but its effectiveness is yet to be tested. In reality, that IAP package contains a variety of commitments inevitable in the case of unilateral announcement.

In terms of tariff reduction, most members indicated their plans over the next several years. Some member countries attached time schedules for reducing down to zero or sectoral details. Many members committed the Uruguay Round (UR) plus alpha, but a significant difference is witnessed between members.

The United States and Japan committed little more than their UR commitments. Japan accelerated its implementation by two years, but it made no further commitment. In addition, Japanese tariff levels increased because of the tariffication of agricultural products. The IAP commitment of the two are short of their Bogor targets. New Zealand, Australia, and Canada committed some additional tariff reduction to their UR commitments, accelerating their reduction in comparison with the Bogor line.

Asian countries committed greater IAP reductions, apparently thanks to their AFTA reduction, lowering their IAP curves far below the Bogor target. China and Chile committed greater tariff reductions, sufficient to achieve their Bogor targets, reflecting their eagerness to join the WTO and NAFTA. On the other hand, IAP commitments by Korea, Chinese Taipei, and Mexico are short of their Bogor targets.

## **Current and Future Issues**

### *Fundamental Problems*

As seen in the above discussions on the present profile of Korean fisheries and changing international fishery orders, the single, most fundamental question facing Korean fisheries is whether they can be sustainable beyond short-term economic gains.

Undermanaged fisheries have long existed within Korean waters, while rapid technological development has been made over a wide range of areas. Today, the consequences of technological progress and maintaining open access are extraordinarily damaging to marine resources. They include the depletion of fish stocks, the dissipation of economic rents, an increase of government financial transfers, and increased conflict among fisheries (Park *et al.* 1992).

In particular, technological progress in fisheries has resulted in a downward shift of the cost function in the very short-run, but sooner or later, it tends to shift

upward. The total economic welfare or economic surplus, defined as the sum of Marshallian consumers' and producers' surpluses, invariably has continued to decrease.

When product prices increase under the pressure of lower supply levels and, in turn, overcapitalization resulting from technological progress, fishermen tend to try to reduce production costs by introducing new technology. The early adopters of innovations enjoy entrepreneurial profits, but as the innovation is diffused, the aggregate supply curve shifts to the left, leading to excessive investment.

Late adopters are forced to adopt the new technology to avoid incurring losses. This process by which fishery incomes have been squeezed out or stagnated can be called a "treadmill trap." The fishermen who are unable to keep up with the treadmill must be ground out of fisheries. They then tend to enter into illegal fishing activities. Thus, in market economies, the serious problem of technological progress in fisheries is that it works to facilitate overcapitalization and rent dissipation (Hayami and Herdt 1977; Cochrane 1958; Owen 1966; and Hayami and Ruttan 1985).

An important task facing Korean fisheries is to design new resource management measures to maintain a balance between technological innovations and fisheries sustainability.

### *Ocean Environments*

The East Asian Seas (EAS), including the East Sea, Yellow Sea, and East China Sea surround the Korean peninsula. The coastal states include Korea, China, DPRK, Japan, and Russia. The EAS is known as one of the most productive fishing grounds in the world. South Korea, North Korea, China, and Japan have coastlines of 11,542, 5,729, 18,000, and 28,000 kilometers in total length, respectively.

The Yellow Sea is a semi-closed area. Its coastal regions have large ports, industrial complexes, and densely populated adjacent cities. Heavy depletion of the Yellow Sea's coastal ecosystem by Korea and China has been underway for at least two decades. In this area, the problem of environmental depletion for economic growth is particularly difficult to solve because environmental impacts stemming from resource depletion and other economic activities usually cross national boundaries of the two countries.

The southern coastal areas also have a steel industry and other huge industrial firms. Coastal water bodies are occupied by a variety of sea farming activities such as fish, shellfish, and seaweed culture. In recent years, these areas have suffered from frequent and large-scale occurrences of red tides, caused by cultural eutrophication, which is simply the anthropogenic acceleration of eutrophication.<sup>6</sup>

The southeast coast has been developed for industry. During the last two decades, tremendous amounts of various pollutants, discharged every day from coastal industrial complexes, have been introduced into the seas and endangered economic survival of fishing villages as well as on- and near-shore ecosystems.<sup>7</sup>

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<sup>6</sup> Eutrophication is a natural process that occurs in virtually all bodies of water. The gradual accumulation of nutrients and organic biomass accompanied by increased levels of production and a decrease in the average depth of the water column caused by sediment accumulation constitute the natural eutrophication process. Cultural eutrophication is simply the anthropogenic acceleration of eutrophication. This anthropogenic acceleration is often brought about by discharges of organic wastes and/or nutrients (Laws 1993).

<sup>7</sup> Recently, high levels of dioxins, which are known as hazardous toxic chemicals as well as environmental hormones (or endocrine disruptors), have been found in many kinds of shellfish and fish (*i.e.*, oyster, sea mussel, flounders, *etc.*). The fish samples were collected from the coastal waters near industrial areas (*i.e.*, Masan, Ulsan, Pohang, Daechon, Ryucheon, *etc.*) (September 23, 1998, *Jungang Ilbo*). The Korean government has begun to give much attention to other toxic chemicals such as TBT and PCB.

The introduction of pollution into seas is perturbation that can set off a complicated series of biological and chemical reactions that affect primary production systems, fish habitats, and, thus resource stocks. A toxic metal, such as mercury, has the most serious impact on the entire food chain—from plant plankton, through juveniles, to human health.<sup>8</sup> Since the early 1980s, environmental progress in Korea has mainly been made through legislation and regulation as a direct result of economic or social pressures. However, so far, comparatively little work has been done to develop a meaningful understanding of the economic impact of ocean environmental regulations and the cost of enforcement and compliance. Similarly, contingent valuation of the ocean environment is in its infancy because the oceans are immense and usually remote. In addition, the role of oceans in support of economic development and human well-being is not really evident to most people, including politicians and lawmakers. To many, the oceans still constitute a huge infinite sink that can absorb anything with impunity. Therefore, money for ocean environmental management is difficult to obtain and expenditures difficult to justify.

### *Small-scale Fisheries*

The Korean small-scale coastal fisheries have long sustained, but rarely enriched, generations of Koreans living on its coast. They were *raison d'être* for the settlement of fishing villages in coastal areas, and have been the economic backbone of a number of fishing communities for several thousand years.<sup>9</sup>

People settled to fish or, if they settled for other reasons, soon turned to fishing in conjunction with their other work. This practice usually involved the exploitation of the surrounding natural resources. They did some farming (if the land would support it), cut some wood (if they had access to wood worth cutting), and hunted and trapped animals (if any were available). In effect, they cobbled together a living, and it was not easy. They lived in a difficult environment and worked within a natural resource economic system that gave little power to workers or small producers.

From its beginnings, the fishery was a conventional staple of the economy. For large areas of the coast, fish was the major product sold to outside markets, and the only substantial source of income. The living provided by the fishery was continually buffeted by the vagaries of nature and markets. People whose existence depended upon the fishery, took as a matter of course its roller coaster nature, as boom and bust alternated every few years. Cyclical economic adjustment was a fact of life.

Along the coast, more than 2,000 fishing villages and hamlets forming small ports are dependent on small-scale coastal fishing activities. Some 85% of those use engine-powered vessels of less than five tons to engage in various pursuits. They include angling; long-line fishing; small-scale bottom trawling; mariculture in shallows and at seashores culturing laver, oyster, scallop, other shellfish; seaweed collecting; and small-scale set-net fisheries. These forms of fishery are, for the most part, run by family labor. Therefore, they are of social, political, and economic importance.

As of 1996, in Korea there were about 102,000 fishery management units, of

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<sup>8</sup> September 23, 1998, *Jungang Ilbo*.

<sup>9</sup> Korean small-scale fisheries comprise a large part of the Korean fisheries, which are a cornerstone of fisheries cooperatives. Today, Korean fisheries cooperatives face a variety of challenges which require betterment of services to their members. The most important questions to be asked are, "What kind of enterprises can the cooperatives expect to survive and prosper in the next century?" and "How do cooperatives check out when compared with certain criteria for future success?"

which 97,000 (95%) could be described as small-scale. Since 1980, there has been a continual decline in the number of management units. This trend is expected to continue for quite a while, and smaller units will engage in SSCF, producing mostly mariculture crops (*i.e.*, laver, brown seaweed, and shellfish). In 1997, production of these culture crops accounted for 93.6% of the total culture yield.

During the last two decades, government guidance and financial support through various subsidies (*i.e.*, loans at lower than market interest rates, *etc.*) greatly encouraged and facilitated small-scale coastal fisheries to modernize and expand their mariculture activities. Government policies (*i.e.*, import control and financial transfers) significantly contributed to maintaining higher prices and stabilizing fishing operations.

However, terms and conditions for all small and large Korean fisheries are getting worse than ever. Domestically, the IMF system, which started in December 1997, places strong constraints on increases in fisheries budgets. Further, fisheries are receiving lower priority. Internationally, reduction or elimination of government financial transfers (*i.e.*, subsidies) is widely being discussed through OECD, WTO, APEC, and PECC. In addition, at the 1997 APEC Ministerial Meeting a final decision was made on early voluntary trade liberalization for nine areas, among which fish and fish products are included. Reduction of government financial transfers (*i.e.*, direct subsidies and tax exemptions) and tariffs will dominantly affect small-scale fisheries.

All this tells us that Korean fisheries may hardly be sustainable even in the intermediate run without transforming small-scale fisheries into a competitive structure. Otherwise, SSCF will work to increase the taxpayer's burden and be a serious limiting factor to restructuring the entire Korean fisheries sector.

### **Policy Implications for Responsible Fisheries**

Toward the 21st century, it is expected that the Korean fisheries will continue to play an important role in food security and nutrition. They will also provide coastal fishing communities with opportunities for income and employment. Distant fishing industries will maintain a fairly large scale of international operation, even though their activities may be reduced to some extent.

In spite of the Korean fisheries' anticipated roles at present and in the future, the fisheries sector embraces serious problems relating to macroeconomic structural changes, depleting resources, ocean environmental deterioration, competitive market conditions, and changing international fishery regimes.

Because of these challenges, the goals of Korean fisheries development need to be defined in terms of sustainable/responsible fisheries. Interpretations will vary, but must share certain general features and flow from a consensus on the basic concept of sustainable fisheries development and on a broad strategic framework for achieving it. Regarding sustainable/responsible fisheries, the strategic framework calls for well-designed machinery that can support effective monitoring and surveillance of fishing activities and ocean environmental conditions.

Past experience tells us that unsuccessful fisheries management, in many cases, has been largely due to insufficient monitoring/surveillance capability and moral hazards. Particularly, moral hazards still prevail over the public domain of the oceans, which often nullify the effectiveness of fisheries management policies. This is especially true in Korean fisheries.

Effective regulations and management of fisheries and the ocean environment can be efficiently encouraged by the use of economic incentives and instruments where sufficient monitoring/surveillance power is secured. However, obtaining capi-

tal necessary for establishing such monitoring systems is very difficult, because oceans are simply far remote from constituency, lawmakers, and administrators.

Table 1 shows the changing paradigms of sustainable/responsible fishery practices and perceptions of the technological innovation era compared with emerging philosophies which may be adopted in the 21st century (Noland 1993). These four areas will affect the way in which Korean fisheries must operate. In this light, a new fisheries strategy is not only desirable, but vital, to the sound management of Korean fisheries. More compelling, however, is the need for a fisheries strategy simply because the role of government looms so large, and government action is so needed.

This strategy will provide a framework for moving forward on such major fishery priorities as balanced, world-class science and technology promotion; fishing community development; and new market arrangements. The broad objective of the Korean fisheries strategy is to secure maximum social, economic, scientific, and sovereignty benefits for Koreans from Korea's marine living resources.

In pursuit of this national objective, the government must commit itself to achieve four basic goals: (1) promotion of dynamic fishing industries, employment, and fishing community development for coastal regions; (2) creation of conditions favorable to the development of first-rate expertise and capabilities in fishery-related science, technology, and engineering; (3) sound management and protection of Korea's marine living resources and the ocean environment; and (4) assertion and protection of sovereign rights over Korea's fishery resources.

To accomplish these goals, a strategic plan needs to be developed which includes the following objectives: (i) stimulate national awareness of Korea's ocean frontier and its importance to Korean sovereignty and fisheries heritage; (ii) foster vigorous internationally competitive fisheries through restructuring the entire fishing industry; in particular, small-scale fisheries; (iii) establish a legal framework to

**Table 1**  
Changing Paradigms

Technology Innovation Era	21st Century
No-limit Philosophy Uncontrolled use of ocean living resources; Waste disposal without regard to the ocean's ability to absorb	Sustainable Development Philosophy Utilize fishery resource on a sustainable basis; Be conscious of ocean's ability to assimilate discharges
Externalized Ocean Environmental Costs Maximize profits by ignoring the social costs of fishing operation; Assume someone else will pay	Internalized Ocean Environmental Costs Balance profits with recognition of ocean; Living resource rent; Build-in pollution control and waste abatement; Clean up one's own mess
Exploitation Maximize use of fishery resources by minimizing recruitment and management effort; Trapped in fishery treadmill and accelerating common tragedy	Conservation Social, resource, and environmental responsibilities; Foster global and/or regional cooperation for resource management; Practice precautionary approach and design an effective monitoring and surveillance system
Closed-market System Wealth vertically distributed and maintained by protectionism; Closed trade markets	Open-market System Wealth horizontally distributed through open markets; Competitive approach to trade

Source: Noland 1993.

support the goals of this strategy; (iv) enhance scientific and technical knowledge and capabilities; and (v) conserve and manage the living resources of the oceans.

The next stage is to develop initiatives that translate the goals and objectives into action. More consultation with fishing industries, provincial governments, and others will be necessary, but more importantly, the spirit of cooperation will be imperative.

Finally, Korea's new fisheries strategy should conform with the internationally adopted principle that, "sustainable fisheries development and responsible practices" depend on significant advances in the management of marine living resources and the minimization of post-harvest practice, government financial transfers, and social problems, while maintaining the integrity of the ocean environment.

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