

Article

The Sociopolitical Economics of Marine Ranching Program in Korea

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Abstract : This paper aims at overviewing Korean fisheries profile with a view on why Korean fisheries need marine ranching program as a new fisheries paradigm - a community-based co-management approach and drawing some policy implications from the advanced experience in fisheries. The aims of community-based co-management approach as a planned approach can be set out under the planning objectives of efficiency and equity. In this context Tongyeong marine ranching program is an important government-sponsored pilot enterprise. Experiences in the advanced fisheries such as Canadian Snow-Crab case suggest that in order to be successful for marine ranching be successful it is necessary that (i) there should be high-value species, (ii) property right should be established, (iii) there should be the reasonable number of participants involved, (iv) the participants and the government should be able to share resource enhancement/management/utilization responsibilities and associated fisheries management expenses. Among these, management cost sharing based on the practical partnership between fishing communities and government is of particular importance because the government must have a full responsibility for all ranching program expenditure unless revenues sufficient to guarantee reasonable income and to share management cost are generated from the ranching business.

Key words : marine ranching program, structural adjustment, community-based management, TAC, driving force-state-response model.

1. Introduction

Production from many of the Korean fisheries has remained constant over the recent years and is not expected to keep up with a growing demand for fish and fish products. In addition, environmental degradation and poor fisheries management have caused several of the Korean fisheries to decline and even collapse. Capture fisheries, in fact, represent the last major activity of humans as hunter-gathers of marine wild living resources. So far even Korean fishing industry heavily relied on such capture fisheries with a little improvement of resource management.

Korea has adopted sea farming in the wake of the loss of productive fishing grounds and decreasing useful resources caused by the seventies' shore reclamation and progressive marine pollution from industrial development.

Korean mariculture production in 1997 reached more than 1 million MT. This production volume tended to be achieved by externalizing marine environmental costs to the entire society. In addition, distant water fisheries also face many difficulties mainly due to the changing international fishery regimes for marine living resource conservation on the high seas.

All this has led to a vicious cycle in the Korean fisheries (e.g., increasing fishing effort → overexploitation or overcapitalization → lowering fisheries income → higher fishing intensity) and has given rise to a variety of sociopolitical economic conflicts between the fishing industries and the government, and among fishermen and fishing communities. Such conflicts result in a continuous negative energy-consuming game between "we and they".

However, around the world, there is now an opportunity to use new resource management system (i.e., community-based co-management approach and marine ranching/hatchery production as important fishery management

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tools) to increase the value of a fishery (e.g., chum salmon enhancement), to maintain a fishery in the face of habitat degradation or loss (e.g., the sturgeon fisheries of the Caspian Sea), to rebuild fisheries such as the red sea bream fishery of Japan, or to create new fisheries as in the case of the striped bass in western North America. These various types of marine ranching have subtle, but important differences in the underlying assumptions about the marine environment to be stocked, the species that will be used and the sociopolitical structure of coastal fishing communities.

This paper in the second section overviews profile of Korean fisheries with a view on why Korean fisheries need new paradigms. The third section briefly analyzes conflict of Korean fisheries. The fourth section proposes new fishery paradigms. The fifth section deals with community-based co-management approach as a conflict-solving prescription. The last section provides concluding remarks.

2. Profile of Korean fisheries

Korean fisheries by and large are comprised of coastal capture fisheries, mariculture and distant water fisheries. From the middle of 1970s capture fishery production has continued to decline and recently stagnated. Now, the distant water fishing operations are experiencing much more difficulty than ever before. This led both the government and the fishermen to make an intensive use of shallow waters through resource enhancement and ocean farming programs. In particular, the bilateral fisheries agreements among Korea, China and Japan work to facilitate mariculture development brought about by squeezed capture fishing ground.

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 the local governments at provincial, city, and district levels. The Korean Law of Fisheries, fishery resource protection legislations, and legislations relating to EEZ 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 ordinances 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), called for better management of fisheries resources in the Korean waters¹. As implementation of Article 61 of the United Nations Convention on the Law of the Sea (UNCLOS) became inevitable, in 1997 the government prepared to amend the rules and regulations to facilitate practices of the total allowable catch (TAC) system. To implement the 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 10 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 (*i.e.*, squid) with unusually high landings.

In addition, the government declared sovereign right in the Korean EEZ (announced in 1996) and its enforcement (announced in 1997). This declaration covers regulations relating to monitoring and control of foreign fishing vessels as well as special rules relating to keeping fishing orders. Enforcement legislation and regulations 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 333.75 billion Korean won (KOW). The coastal fisheries received 324.73 billion KOW, and the distant-water fishing sector received 9.02 billion KOW. At present, financial support is provided in the form of loans, which have lower than market interest rates to stabilize/improve the terms and conditions of fisheries management. To

¹CPUE (catch per unit effort, GT) of overall adjacent fisheries has continued to decline for the last 25 years: 4.7 MT 1975; 3.4 MT 1990; 3.0 MT 1998.

²It seems true that shrimp farming can be harmful to marine environment. However, unfortunately, the data about what percentage of this money was self-financed for preventing environmental pollution is unavailable.

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 KOW were granted to develop shrimp-farming salt ponds² 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. It was also expanded to facilitate structural adjustment of coastal fisheries, development of mariculture, and establishment of market and fishing facilities.

Structural adjustment

Structural adjustment of the fishery sector originating from the special law for agricultural and fishing village development which was put into legislation 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 the integral part of the government policy for structural adjustment of the fisheries sector since 1994. In 1997, 135 fishing vessels were retired; 48 coastal and 87 offshore vessels. Capacity reduction was aimed mainly at non-viable 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.) were included in this program.

Capture fisheries

Employment and fleet structure

In 1997, the total number of households in Korea involved in marine fisheries was about 102,000 units, 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

Quantity and value of capture fishery harvest consisting of coastal and distant-water fisheries in 1997 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 has declined to 10 % of the 1985 level, but catches of squid, anchovy, and mackerel increased considerably. Increasing exploitation of species with an 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 fishery resources 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.

Mariculture and the environment

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

In spite of the increase in production volume and value, declining product quality has been noted, mainly due to deteriorating environmental conditions at sea aqua-farms. This necessitated adoption of environmentally sound sea farm management and farming methods. The government introduced coastal aquaculture maintenance programs comprising 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 KOW in 1997. The benefits of the coastal aquaculture maintenance programs were clearly demonstrated by regeneration of aquatic microorganisms (e.g., planktons) and increased productivity as well as improved quality of products.

Consumption and trade

Consumption of fishery products has continually increased since 1991, and per capita consumption in 1997 reached 45 kg. Habit persistence of Korean people is 0.5 in comparison with maximum 1.0 for the 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 of fish and fish products, a decrease of 3.3 % over 1996. Major export species were tuna, fish cake, squid, and arkshell; while 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 the remaining 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. Korea abolished the export promotion system applied to the eight items, including fresh and frozen sole and eel that were intended to prevent over-competition among the domestic fishing households.

3. Social, political conflicts: myth and realities

Fisheries around the Korean Peninsula have existed for many thousands of years, but commercial fishing operations have existed only for half a century after the Korean War. Folklore has developed around the fisheries that mix important elements of truth with misconceptions and unwarranted generalizations. Several of the more important and widespread conceptions will be analyzed briefly to separate myth from reality, with particular emphasis on the sources of conflict in the fishery, especially the issues surrounding the so-called sociopolitical, economic conflict over resource allocation and fishery development.

However, the great majority of Korean society seem to be satisfied with appearance of the current situation of the fisheries, as though it is reality, and are often influenced more by the things that seem than by those that are.

Dilemma in fisheries management and technology development

Taking a close look at the current 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 under the present unbalanced use of fishery resources.

Undermanaged fisheries have long existed within Korean

³Marshallian consumers surplus is the difference between the price a consumer actually pays for some given amount of a good and the price that the consumer would have been willing to pay rather than do without it, while producer surplus is the amount producers receive above and beyond the minimum prices that would have been required to get them to produce and sell their output.

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 devastating the marine resources. They include the depletion of fish stocks, the dissipation of economic rents, the ever increasing 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 marginal cost function in the very short run, but sooner or later tends to shift it upward. The total economic welfare or economic surplus, defined as the sum of Marshallian consumers' and producers' surpluses³, invariably has continued to decrease.

When product prices increase under the pressure of lower supply levels and, in turn, over-investment resulting from technological progress, fishermen tend to try to reduce production costs by adopting 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 capacity. Late adopters are forced to introduce 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 phenomenon". The fishermen who are unable to keep up with the treadmill must be ground out of fisheries, and they then tend to easily enter into illegal fishing activities. Thus, in market economies, technological progress in fisheries tends to pause the problem that it works to facilitate overcapitalization and rent dissipation (Hayami and Herdt 1977; Cochrane 1958; Owen 1966; Hayami and Ruttan 1985).

"We versus They" and "Inshore versus Offshore"

The theme that surface frequently in fishing society is the atmosphere of disharmony which infects the Korean fisheries. It seems evident that the common property nature of the fishery is the fundamental cause. When everyone competes for a share of a common but limited resource, the result is a zero-sum game; one man's gain is always another's loss. All the conflicts over allocation—whether between provinces, between inshore fisheries, between inshore and offshore fleets, between fishermen, or between fishermen and government—are of this type. And the conflict will become more intense when there is no longer any new growth to allocate.

The we/they attitude will remain as long as participants in the fishery fail to see themselves as part of a large economic system pitted against foreign competitors in the international seafood market. Korean fishermen fall short of their potential as long as competitive energies are dissipated in domestic conflicts.

In addition, conflicts in the fishery, in particular, after the fishery agreements with Japan and China have been symbolized by the tug of war between the inshore and offshore sectors for more limited use of coastal fishery resources. While the conflicts are real, the terms used to characterize them are misleading. The point at issue is not the resource allocation, rather the control of distance of fishing ground at which fish are caught. In fact distinction between inshore and offshore fisheries is made generally based on fleet size rather than distance from land.

Large trawlers and purse seines have sought of year-round catch. This led them to oppose the existing allocation of fishing ground to inshore fisheries sector who had a little conflict with offshore fisheries before the bilateral fishery agreements. In general inshore fisheries are portrayed as the social fisheries while the offshore is thought to be capital-intensive and economically efficient. However, there are some situations where the reverse is true. For example, the inshore-based fisheries such as inshore squid-angling, longline and trap fisheries tend to be more successful than large trawler-based fisheries, which previously operated in the East China Sea.

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. They have been the economic backbone of a number of fishing communities for several thousand years⁴.

People settled to fish or, if they settled for other reasons, they 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 were not easy. They lived in a difficult environment and worked within

⁴Korean small-scale fisheries comprise a large part of the entire 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?"

natural resource economic system that gave little power to workers or small producers.

From its beginnings, the fishery was the basic of a conventional staple 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 subsist mainly on small-scale coastal fisheries (SSCF), in which people 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 seashores for culturing laver, oyster, scallop, shellfish and seaweed collecting, and small-scale set-net fisheries. These forms of fishery are, for the most part, run by family labor with a few members. Therefore, they are of social, political, and economic importance.

As of 1998, in Korea there were about 98,972 fishery management units, of which 95 per cent of the total units 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 and produce mostly mariculture crops (*i.e.*, laver, brown seaweed, and shellfish). In 1998, production of these culture crops accounted for 93.6 % of the total culture yield (777 thousand MT).

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 of all small and large Korean fisheries are getting worse than ever before in history. Domestically, the IMF system, which started in December 1997, places strong constraints on increases in fisheries budgets. Fishery priorities are getting lower. 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 to a competitive structure. Otherwise, SSCF will work to increase sociopolitical tension and taxpayers burden and be a serious limiting factor to restructuring the entire Korean fisheries sector.

Competing use of coastal regions and marine environments

The East Asian Seas (EAS), including the East Sea, the Yellow Sea, and the East China Sea surround the Korean Peninsula. The coastal states include Korea, DPRK, China, 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 many 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 be solved because environmental impacts on coastal waters stemming from a variety of 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 large number of sea farming activities such as fish, shellfish, and seaweed mariculture. 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 eutrophication⁵. The southeast tidal flat has been reclaimed for industrial and large-scale agricultural developments. During the last two decades, tremendous amount of various pollutants discharged everyday from coastal industrial complexes have been introduced into the inshores and endangered economic survival of fishing villages as well as on- and near-shore ecosystems⁶.

The discharge of pollutants into the coastal waters causes 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 impacts on the entire food chain - from phytoplankton, through juveniles, to human⁷. 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 usually remote and are immense. In addition, the oceans' role in support of economic development and national 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.

4. Transition to new policy paradigms for sustainable fisheries

It is expected that the Korean fisheries will continue to play an important role in food security and nutritional requirements. 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 sociopolitical conflicts, structural changes, depleting resources, ocean environmental deterioration, market competition, 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 must 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 a well-designed and coordinated machinery that can lessen conflicts between fishing entities as well as that can support effective monitoring and surveillance for fishing activities and ocean environmental conditions.

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

Effective regulations and management of fisheries and the ocean environment can be efficiently encouraged by the use of economic incentives and self-regulatory system where co-management scheme and sufficient monitoring/surveillance power are secured. Obtaining capital necessary for establishing such monitoring systems, however, is very difficult because oceans are simply far remote from constituency, lawmakers, and administrators⁸.

Table 1 shows the changing paradigms of sustainable/responsible fishery practices and perceptions of the technological, sociopolitical, economic innovation era compared with emerging philosophies. These four areas will affect the way in which Korean fisheries 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 fishing industries' action is so needed.

⁵Eutrophication 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).

⁶Recently, high level of dioxins, which are known as hazardous toxic chemicals as well as environmental hormones (or endocrine disruptors), has 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, Ulgin, Pohang, Daechoen, Ryucheon, etc.) (September 23, 1998, *Jungang Ilbo*). The Korean government began to give much attention to other toxic chemicals such as TBT and PCB.

⁷*Ibid.*

⁸Park, Seong K. 1999. Marine Resource Economics. Vol. 14: 79-93.

Table 1. Changing paradigms (After Noland 1993).

Technology Innovation Era	21 st Century
<i>No limit philosophy</i> Uncontrolled use of ocean living resources Waste disposal without regard to the ocean's ability to absorb	<i>Sustainable development philosophy</i> Utilize fishery resource on a sustainable basis Be conscious of ocean's ability to assimilate discharges
<i>Externalized marine environmental cost</i> Externalized ocean environmental costs Maximize profits by ignoring the social costs of fishing operation Assume someone else will pay	<i>Internalized ocean environmental costs</i> Balance profits with recognition of ocean living resource rent Build-in pollution control and waste abatement Clean up one's own mess
<i>Exploitation</i> Maximize use of fishery resources by minimizing recruitment and management effort Trapped in fishery treadmill and accelerating common tragedy	<i>Conservation</i> 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
<i>Closed market system</i> Wealth vertically distributed and maintained by protectionism Closed trade markets	<i>Open market system</i> Wealth horizontally distributed through open markets Competitive approach to trade
<i>Centralized administration</i> Central government initiatives	<i>Decentralized decision-making</i> Community-based approach

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 sovereign benefits for Koreans from Korea's marine living resources.

In pursuit of this national objective, the fishery communities and the government commit themselves to achieve three basic goals:

Cooperative promotion of dynamic fishing industries, employment, and fishing community development for coastal regions;

Cooperative creation of conditions favorable to the development of first-rate expertise and capabilities in fishery-related science, technology and engineering;

Cooperative management and protection of Korea's marine living resources and the ocean environment.

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

5. Korean marine ranching program: community-based co-management approach

Coastal community and fisheries resource management

Fisheries have an important socio-political-economic

role in Korea. There are more than 2,000 fishing villages and about 1,800 fishing village-based organizations along the Korean Peninsula. An estimated some 180 thousand people are directly involved in fisheries and the number may reach as high as 800 thousand including the post-harvest sector. Over the last 40 years, Korean fisheries have followed by and large Japanese fisheries. A majority of Korean fisheries projects has been technology-led based on the premise that production increases would lead to increases in the living standards of fishers and their communities, and have also advocated and attempted to transfer Japan-originated technologies and fisheries management system.

First, it has been recognized that fisheries development based on technology-led approaches has been widely unsuccessful. Second, it is also recognized that fisheries are increasingly overexploited and that centrally controlled management systems have had only limited success. Third, the problems of fisheries overexploitation and fishing community poverty must be viewed within the context of the wider social, political, economic systems of which fisheries are just one constituent part. Associated directly with this is the need to improve policy which impacts directly or indirectly on the fisheries development. Fourth, it is now recognized that many fisheries, as an example of a common property resource, have been managed effectively in the past by local community-based fisheries management institutions, which have often been displaced or ignored by centrally-controlled management system.

Aims of the community-based approach

Decentralized approaches to natural resource management,

of which community-based management is one type, have received an increasing amount of attention from governments around the world in recent years in response to the failure of centralized management and the need to search for improved approaches (Pomeroy and Williams 1994).

The community-based approach as a decentralized paradigm to renewable natural resource management implies that decisions as to the use of such resources are made at community level, with a view to their sustainable use. The aims of community-based approach as a planned approach can be set out under the planning objectives of efficiency and equity, as follows (Neiland *et al.* 1996);

Resource/administrative efficiency

Resource use efficiency: Sustainable use of resources and protection from undesired uses,

Administrative efficiency: Speedier and more effective decision-making and implementation with regard to resource use at reduced financial cost.

Political/economic equity

Political equity: Greater involvement and influence by local people in decisions affecting their lives (empowerment),

Economic equity: The distribution of benefits from resource management so that underprivileged people get equal or greater than equal share.

It is important to recognize that, as with any approach with a number of aims, some of these may conflict in practice. Locating management authority at community level has the potential under certain circumstances to increase the efficiency both of administration and of resource use itself. With regard to equity, the results of community management will only be equitable to the extent that community social structure itself is equitable, in terms of the distribution of wealth and of political influence. Equity between communities is a factor to be considered, and one which will probably involve mediation at a high level of government.

Korean fisheries management system has shifted to decentralized system from centralized one since the late 1970s. As a result, the provincial governments became to gain more control on sea culture, inshore fisheries and coastal fishing community development. However, many lower fishery laws still require the provincial governments

to make obligatory consultation with the central government in relation to such major policy planning and implementation as fisheries permits and licenses and fishing community development.

During the last two decade, the Korean government pursued marine ranching program (MRP) under the initiatives of the central government. The key elements of the MRP were the establishments of artificial reefs and the releasing of young fish into the inshore waters, accompanying a huge amount of government expenditure. However, there are hot debates on its economic efficiency and income distribution. Recently, the government changed its MRP to a large-scale intensive project from the extensive program, centering the project onto the specific areas (e.g., Tongyeong), being considered as one of the most suitable areas in Korea⁹.

Community-based co-management approach

Traditional fisheries systems in Korea have evolved based on the delimitation of property rights and their control by communities or fishermen's groups in coastal environments. The organization of use rights and the ability by the group to exclude other uses have in turn brought benefits to the participants in the system. It includes restrictions on fishing time and area and technical inadequacies.

The possibility that traditional fisheries management approaches could provide a basis for improved management in certain fisheries is presently being explored by various agencies (FAO 1993, Pomeroy and William 1994) through the co-management approach. The type of common property regimes in fisheries, which evolved through traditional management practices can rarely now provide the answer to contemporary management problems. A more pragmatic approach is to develop a partnership between fishing communities and government in a co-management strategy where responsibility for fisheries management is shared. Community-based management is seen as a central element of co-management. The key idea being that self-involvement in the management of the resource will lead, for example, to a stronger commitment to comply with the management strategy and sustainable resource use. However, it is important to recognize that co-management may not be workable or suitable for all fisheries, and the pre-conditions or facilitating factors for development will

⁹Kim, Jong M. *et al.* 1998, Studies on the Development of Marine Ranching Program in Tongyeong, Korea, Korea Oceanographic Research Institute and Ministry of Maritime Affairs and Fisheries. There in Tongyeong marine ranching area are 14 fishing villages and 12 Erchongae (i.e., fishing village organizations) and 800 members.

h objectives, compliance with management measures, alleviation of tension associated with fisheries management and benefit-cost sharing, etc.

In addition, there are many factors at the level of the fishery environment and within the nature of the fishing villages and communities in Korea, which could facilitate the development of a community-based co-management approach in certain locations. For example, the fisheries need to be well-defined and there has to be a strong association between communities and their fishery environment. Local management systems might also provide the basis for the future development, providing a structure and operation, which might be adapted to meet the objectives of improved resource usage and administrative efficiencies. Social, economic, institutional aspects are analyzed briefly as follows¹⁰.

Socio-economics

To manage stock enhancement and marine ranching, in addition to managing biological systems, is also to manage investment. To manage investment is in turn to manage both social and economic systems. The investment made will introduce a whole range of uncertainties and requirements that must be carefully handled; (i) the relationship between the investment and the economic return, (ii) the transformation of scientific knowledge into economic enterprises, (iii) institutions to handle questions of access and property rights, and (iv) in some models of sea ranching and complex issues of distribution. Distribution issues would be critical where a large number of participants, groups, or organizations are involved in sea ranching program.

Existing/established institutions in coastal areas

Traditional fisheries and other users of marine resources with economic interests in the existing production pattern, and with local and national political support, are major determinants for the implementation of projects that intend to make new institutions already claiming authority over competing resources. The system of property rights is strongly defined in general and also deeply culturally integrated. Property rights are first and foremost a definition of access. If the boundaries are difficult to be defined and also complicated to be defended, to establish

private property rights will take place when the benefits of claiming rights exceed the cost of negotiating and enforcing those rights. At the introductory stage of sea ranching, the cost of enforcing private property rights might easily exceed the benefits.

The law on marine ranching

One way to reduce uncertainty related to access is to exclude some form of extraction. This can be done for a single species. A major concern in a marine ranching operation is to reduce the uncertainty for the investment of fishing villages involved by giving legal right to protect the investment. In social systems, certainty for some implies uncertainty for others, and the net result is often increased uncertainty for all. The constitution of property rights within a coastal environment largely defined by common property resources is bound to create tension and conflicts (Knudsen 1995). This is especially true if some traditional users are excluded, and the enhancement agency is also fishing village organizations for profitable business. The law on marine ranching may also create management uncertainty and tensions if it progresses that fishing can also be regulated outside the recapture area if it is found necessary to protect the right to recapture, without regard to regulations made on the basis of other laws. The consequences could be a management battlefield if ranching should be worth listening to the following conclusion based on Japanese experiences (Abd-Elmoneim and Masuda 1991); '*because salmon fishing operations are managed through fisheries co-operatives, and they implement a principal of equality among members, fishermen are satisfied with the management system. However, if set-net fisheries were managed through individuals or private companies, problems could emerge regarding how profits would be distributed*'.

Canadian snow crab case: co-management scheme¹¹

In late 1995, Department of Fisheries and Ocean (DFO) launched a partnering pilot project with the Crab 19 license holders to seek a long-term management solution for the fishery. DFO entered into formal negotiations directly with the Area 19 Snow Crab Fishermen's Association, a subset of the former Snow Crab Working Group. DFO's negotiating team was led by the Area

¹⁰Hallenstvedt, Abraham. 1999. Management of Enhanced Stocks: Social, Economic and Access Issues. p.493-508. In: *Stock Enhancement and Sea Ranching*, eds. by Bari R. Howell, Erlend Moksness, and Terje Svasand. Fishing News Press.

¹¹OECD. 2000. Canada's Case Study Contribution to the Study on the Costs of Managing Fisheries, AGR/Fi/RD(2000)10. This paper presents a successful case of co-management approach in Canadian Snow Crab Fishery at the 86th OEC/COFI Meeting.

Manager, with support from members of Fisheries Management and Science Branches. The Area 19 Snow Crab Fisherman Association was represented by their six-member executive and by legal counsel. The result of the negotiations was a document describing the major points of agreement reached. DFO communicated the points of agreement to the association regarding the agreement. All parties were advised, however, that changes to the points of agreement could only be made at the DFO/Snow Crab Association negotiating table.

The points of agreement document became the basis of the Joint Project Agreement (JPA) and provided the guiding principles for the multi-year Integrated Fisheries Management Plan (IFMP). The plan has a term of 5 years from 1996 to 2000. The IFMP is not a legal contract and it may be altered at any time by the Minister for conservation or any other reason under the discretionary powers conferred by the Fisheries Act.

Determining the annual TAC

This fishery is managed using a Total Allowable Catch (TAC) system whereby the amount to be fished is determined using scientific and industry input. The TAC is determined annually as percentage (exploitation rate) of the estimated commercially available biomass (fishable biomass) so as to optimize the yield while at the same time not exposing the resource to the risk of overexploitation. The exploitation DFO in there Stock Status Report. Exploitation rate above or below the 40 % to 50 % range require the consent of DFO.

Once the TAC is set, the Individual Transferable Quotas (ITQs) are established based on a per trap amount. The total number of traps was set 1,480 in the 1996 agreement. Temporary annual increases in trap numbers will occur if the harvest value reaches pre-set trigger values (see additional sharing below). In addition to the above output controls (TAC, ITQ), several input controls are also applied in this fishery such as trap limits, size limits, no females retained, number of fishers, etc. However, if the incidence of immature crab (white shell or soft shell) taken at sea exceed 20 % at any point in the season; the fishery will be closed for the year.

The snow crab licenses are issued under the absolute discretion of the Minister. The Minister can alter the management plan any time for the purpose of conserving and or protecting the fishery resource.

Additional sharing

Additional sharing will occur when the fishery has an

abnormally high dollar value. This can occur either as a result of high stock levels (high TAC) or high for snow crab, or both. The dollar trigger values were set in the IFMP. A value of CAD 13.32 million was set for 1996, based upon the landed value of the 1995 fishery. The trigger value of the fishery will be established based upon the TAC and the expected price. If this dollar value is 90 % or less of the trigger value, 100 % of the quota will be allocated to the 111 license holders. If the projected value is greater than 90 % or less of the trigger value, 100 % of the quota will be allocated to the 111 license holders. If the projected value greater than 90 % then the following steps will occur: (i) allocate 90 % of the year's trigger value to the existing fleet, (ii) after two weeks of fishing, confirm the price in consultation with fishers, (iii) allocate the remaining quota required to reach the trigger value to the existing fleet, (iv) share the additional quota above the trigger value, equally (50 %) to the existing fleet and as temporary permits to area core fishers for a possible late summer fishery. The portion allocated to the core fishers is done at the Department of Fisheries and Oceans' discretion.

License rules

The following license rules have been in place since 1996. All landings are subject to third party monitoring by a DFO approved Dockside Monitoring Company: (i) permanent transfers of traps are allowed, (ii) the total number of traps that any one fisher can hold is 26; the minimum number is 4, (iii) the number of license holders is fixed at 111, no more, no less, (iv) no fisher can hold more than one snow crab license, therefore the last 4 traps of a license may only be reissued to a core fisher, or to a qualified entrant not already holding a snow crab license, (v) fishers can combine up to 26 traps to be fished from one vessel; however, all license holders involved must be on board during fishing.

Consultation mechanisms

The Joint Management Committee, consisting of representatives of the Minister and representatives of the Area 19 Snow Crab Fisherman's Association, makes decisions regarding the implementation of the Integrated Fisheries Management Plan. The committee oversees the management and administration so that the fishery is efficiently managed through a long-term co-operative relationship, fostered by trust and respect, and based on principles of conservation and environmental sustainability.

Fisheries services

Research is carried out by both the Department and the Association. The latter's responsibilities are to conduct a trawl survey. DFO monitors the fishery and provides statistical services, as well as data analysis and reporting. A number of main results are anticipated from the trawl survey: annual biomass estimates, prediction of recruitment fluctuations, estimation of population characteristics and predictions regarding changes therein, preparation of stock distribution charts, and increased knowledge of the snow crab life cycle and migration patterns. The information on abundance provided through the analysis of the trawl survey as well as other sources factors directly into the TAC, which is set annually.

Management services include licensing, setting and allocating quotas, and the monitoring of landings. Licenses are issued by DFO; the Minister has absolute discretion as per section 7 of the Fisheries Act to revoke licenses. Quotas are determined as the product of the exploitation rate chosen by the industry and the fishable biomass as estimated by DFO (see above, determining the annual TAC for further details). Quotas are allocated based upon the number of traps. Additional sharing to occur if the projected harvest exceeds the pre-set trigger values.

Enforcement Services: The primary focus of enforcement in Area 19 is on the overall quota. The main enforcement program consists of the fishery officers on land and at sea, a Dockside Monitoring Program, the At-Sea Observer Program, air surveillance, dockside monitoring and patrol vessels. DFO patrol vessels are used mainly to monitor the zone boundaries, and to provide fishery officers with a platform to verify trap legalities, board fishing boats and inspect catches, gear, log books, licenses, registration, etc. Fishing zones are patrolled sporadically by a government aircraft to ensure that fishing is being carried out by the authorized vessels in open zones.

The financing of fisheries services is specified in the agreement between the Association and the Minister. The basic formula is that the Association pays for the trawl survey, about CAD 100 thousand per year, plus 50 % of the enforcement management costs. The latter was estimated to be CAD 200 thousand per year, putting the total cost to the Association at CAD 200 thousand and the cost to the Minister at CAD 100 thousand. This formula was used because when the agreement was signed, DFO had some difficulty in identifying management costs on a fishery by fishery basis. The amounts contributed by the Association and the Minister are additive. Funds paid to the Minister by the Association are to buy services in

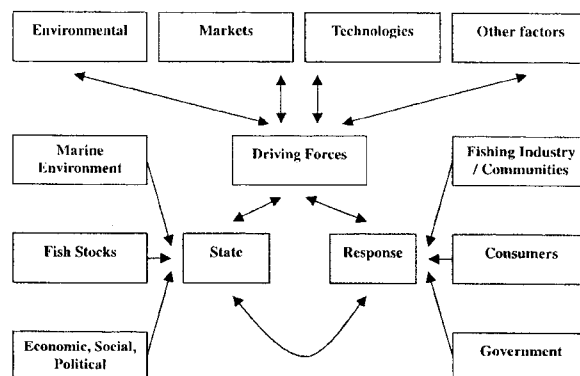


Fig. 1. The driving force-state-response framework in the Korean Fisheries Context (After OECD: AGR /FI (2000)5/REV 1).

additional to those provided for in the Ministers budget.

Results of the agreement, first five years

The agreement has been well received by stakeholders. The fishers have a positive view of the agreement and have proposed that the new agreement starting in 2001 be for 10 years. This is longer than currently permitted by legislation. In the wider community, the agreement has had a stabilizing effect. Before the agreement, there were annual blockades by those wanting access to this fishery. The department has had a positive experience, and characterizes the relationship as co-operative and an improvement on what was already a fairly good relationship.

6. Concluding remarks

Korean experiences with many fish stocks over the decades have shown that the conventional management of fishery resources does not work once the fishing capacity of the fleet approaches to or exceeds the ability of the stock to sustain it. Failing adjacent fisheries have been characterized by declining total yields, sharp decreases in the yield per unit of fishing effort, the disappearance of more highly valued species, cut-throat competition among fishermen, in some cases the economic collapse of the fishing industry and communities, and sociopolitical conflicts between fishery entities.

This situation of Korean fisheries may be described by a driving force-state-response framework, which addresses a set of questions related to the linkages between causes, effects and actions. What are the effects of fishing and other human activities on the resources and marine environment,

as well as on the economic and sociopolitical conditions of the fishing industry, people and government (state)? What actions could be taken to respond to changes in the state of the resource and marine environment or in the state of the industry and people/communities (response)?

There are a number of important domestic/international driving forces such as debates on government financial transfers, fishing capacity and market liberalization, which affect and/or can affect the current/future Korean fisheries state. Now, Korean fishing industry/communities, consumers and government began to respond to the driving forces. Government response actions are emerging through changes in a variety of fisheries policies (i.e., TAC, co-management etc.). One of them is a new coastal fisheries management, which is a community-based co-management, so-called the Tonyeong Jacopever marine ranching program.

Experiences in the advanced countries suggest that in order for marine ranching to be successful it is necessary that there should be high-value species, property rights should be established, there should be the reasonable number of participants involved, and the participants and the government should be able to share resource enhancement/management/utilization responsibilities and associated fisheries management expenses. Among these, management cost sharing based on the practical partnership is of particular importance because the government must have a full responsibility for all ranching expenditure unless revenues sufficient to guarantee reasonable income and to share management cost are generated from the ranching enterprise.

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