Kagodo Myok Grounds II
Institutional Analysis of Korean Fisheries

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Location: Eastern Asia, specifically, the Republic of Korea (South Korea) located on the southern half of the Korean Peninsula bordering the Sea of Japan and the Yellow Sea (The World Factbook, 2012).

The original study area (1972) encompassed three distinct locations:

Kagodo Island located in the southwest off the west coast of Cholla Nam-do province. In the 1970s, Kagodo Island represented one of the most geographically isolated places in South Korea.

Hamgumi village is one of fourteen villages located on Kumodo Island off the south coast of Cholla Nam-do province.

Sokpyong is a coastal village located on the east coast of Kyongsang Puk-do Province.

Google maps:
http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=Daeri%2C+Hangni+and+Daepu%2C+Cholla+Nam-do+Province%2C+Korea

Source: http://geology.com/world/south-korea-satellite-image.shtml

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REPUBLIC OF KOREA (SOUTH KOREA) STATISTICS

General Statistical Data	
Total geographical area [1]	99,720 km^2 (land: 96,920 km^2; water: 2,800 km^2)
Exclusive Economic Zone [1]	200 nautical miles (= 230.155 miles / 370.4 km)
Total population (2012) [1]	48,860,500
Population Growth Rate (2012 estimate) [1]	0.204%
Population below poverty line (2006 estimate) [1]	15%
Ethnic groups [1]	Korean (homogeneous) with the exception of about 20,000 Chinese

Fisheries Socio-Economic Statistical Data			
Number of fishing village cooperatives (2001) [2] Number of fishery corporations (2010)[3]	1,722 775 (764 fishery incorporated associations & 11 fishery companies)		
	1995		2003
Number of fishery households [4]	104,000		73,000
Percentage decline in fishery households (1993-2003) [4]	-4.4%		
	1995		2003
Fishery household population [4]	347,000		212,000
Percentage decline in fishery population (1993-2003) [4]	-6.3%		
	2000		2003
Age structure in fishing villages [4]	0-14 33,000 15-64 187,000 65+ 31,000		0-14 26,000 15-64 152,000 65+ 34,000
	2006	2010	Compare to 2011 average household income [5]:
Fishery Household Income (in thousand won) [6]	30,006	35,696	46,104
Percentage change in fishery household income (2009-2010) [5]	+5.2%		
	2006		2010
Fishery household assets (in thousand won) [6]	209,644		258,872
Percentage change in fishery assets (2009-2010) [6]	+0.7%		
	2006		2010
Fishery household liabilities (fishing & aquaculture) (in thousand won) [6]	17,275		18,277
Percentage change in fishery household liabilities (2009-2010) [6]	-4.0%		

[1] The World Factbook, 2012
[2] Cheong, 2001
[3] Preliminary results, 2011 – **Note: Unable to verify whether data on fishery corporations includes fishing cooperatives**
[4] The Summary of Results, 2004
[5] Household Income, 2012
[6] Results of the Farm and Fishery Household, 2011

RESOURCE SYSTEM INFORMATION

Resource System Size: Unknown size (original study area)

Exclusive Economic Zone (EEZ): 475,469 km^2 [6]
Inshore Fishing Area (IFA): 97,246 km^2 [7]

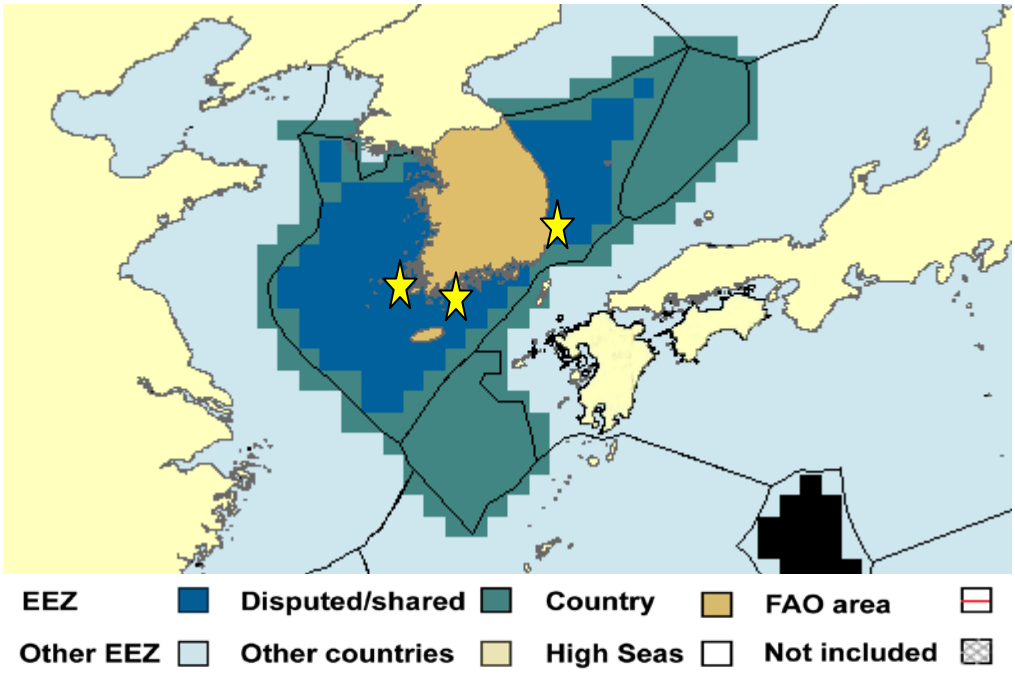
Resource Unit Type: Fishery.

Original study by Han focused mainly on Myok (seaweed), but also included the following marine organisms harvested by villagers: anchovy, squid, octopus, shrimp and shellfish harvested at varying levels depending on season and location.

Scientific studies reviewed for this update focus mainly on economically significant species, including, but not limited to, mackerel, sardine, red snow crab, fun mussels, Washington clam (purplish), Cheju Island top shell, blue and king crab (Ryu, J.G., et al., 2006).

Marine species' mobility varies from stationary (seaweed), to limited range of movement (crabs, mussels, clams), to transient and highly mobile (mackerel, sardine).

South Korea Exclusive Economic Zone (EEZ)



Excl. Econ. Zone (EEZ):
475,469 km^2
Shelf area:
292,522 km^2
Inshore Fishing Area (IFA):
97,246 km^2
Coral reefs:
0.0 % of world
Sea mounts:
0.1 % of world
Primary production:
923 mgC·m-2·day-1

Disclaimer: The maritime limits and boundaries shown on this map are not to be considered as an authority on the delimitation of international maritime boundaries.

Source: Adapted from the Sea Around Us Project: EEZ Waters of Korea (South)

Approx. location of the three areas included in Han's 1972 study

[7] Data taken from the *Sea Around Us Project*

I. CASE HISTORY SUMMARY

Prior Case Analysis

This paper is an update on Schlager and Tang's analysis of Sang-Bok Han's 1972 Ph.D. dissertation (Case No. 86) on field work conducted from 1968 to 1972 in three small-scale fishing communities in the Republic of Korea (South Korea) (as outlined above). Specifically, Schlager, et al., coded the following key social-ecological system (SES) criteria:

- The quantity of marine resources withdrawn and the number of marine resources available was reported as balanced (educated guess).
- Marine resources were mainly sold in external markets but were also consumed by the fishermen and their families.
- Fishermen shared high to moderate levels of trust among each other. Interactions between social actors were conducted in a positive, reciprocal manner.
- No problems reported with pollution, and no reported technical externalities due to the appropriation methods of fishermen.
- Formal owner of the resource is the Korean central government. Fishermen have well-defined *de jure* rights of access to the resource.

The following details outlined in Han's 1972 dissertation were not specifically addressed in Schlager's report but signify changes to the South Korean fishery SES:

- Han's study focused on three villages that varied in isolation from very isolated (Kagodo island), to moderately isolated (Hamgumi), to a semi-urban setting (Sokpyong). His study findings reflected that economic conditions and technological advances increased concomitantly with the degree of exposure by villagers to outside market influences, with the poorest economic conditions and least technological advances evident on Kagodo island, and the highest level of technological advancement and greatest economic security in Sokpyong.
- As technology and economic prosperity within the villages increased, fishing productivity improved, and fishermen became more competitive and profit-seeking. Fish and other marine resources were increasingly exploited to meet outside market demands, not individual needs.
- Han observed that with greater economic productivity also came a redistribution of earnings and a shift away from the traditional subsistence, reciprocal lifestyle. Villagers with the financial wherewithal to own motorboats and nylon nets rose to village upper class, and fishing village society began to exhibit an increasing gap between wealthy and poor fishermen.
- Han used the ownership of the myok collecting grounds as a model for understanding the process of socio-economic change within fishing villages. He noted the following evolution of property rights with regard to marine common pool resources:

    - ❖ Early period of human settlement: no limitations or restrictions on the rights to collect myok (open access - no ownership resource rights);

    - ❖ With increasing population size, the subtractability and non-excludability of the resource mandated certain resource access rights restrictions to maintain the resource at a level that met existing community members' subsistence needs (communal ownership for subsistence) – as evidenced on Kagodo island;

- Traditionally, all the myok collecting grounds on the east coast were privately owned by village elites who passed ownership on to their sons who, in turn, rented access rights to poor tenant fishermen at high rates (private ownership) – as evidenced in Sokpyong;

- In 1962, the Korean government declared that all seaweed collecting grounds were communally owned and to be managed by village cooperatives. However, in 1969, most myok grounds in Sokpyong remained under private ownership.

- In Hamgumi, the myok collecting grounds were communally owned, but the village sold the collecting rights to an entrepreneur who harvested the seaweed for personal profit and employed village women divers (collective ownership for market).

Although Han acknowledged the connection between the "maximization of technological efficiency" in fishing and marine resource depletion, he believed that a national law enacted in 1964, which mandated fishing licenses and prohibited the unlimited catching of fish, would be sufficient to avoid overexploitation. Moreover, Han felt that the fishermen's cooperative movement would be a prime factor in bringing greater socio-economic improvement to fishing villages in South Korea by the "effective readjustment to the local environment and to fishing," as evidenced in the developments he observed in Hamgumi and Sokpyong.

Current status (2012):

No case studies were found that provided an update as to the current SES status of the three villages Han studied.

This paper attempts to provide a synopsis of recent study findings related to institutional changes that have occurred since the 1970s, and how those changes have affected the overall SES robustness of Korean fisheries. In doing so, the scope of the original study area was broadened to include various types of marine species harvested along the entire South Korean peninsula within the country's Exclusive Economic Zone (EEZ).

The literature and statistical data reviewed indicates that over the past 40 years the following social-ecological changes have occurred:

- *Improved economic conditions for fishery households.* After many decades of significant economic disparity between fishery households and the rest of the Korean population, 2011 economic data indicates that the average annual fishery household income has improved and now is only approximately 10.4 million won/year (approx. U.S. $9,000.00/year) less than the average national annual household income (see Statistical Data, p. 3).
- *Fewer and older fishermen with an indication of a possible reversal of this trend.* Statistical data reflects that the number of fishery households/fishery household population has dropped from 104,000/347,000 in 1995 to 73,000/212,000 in 2003, while at the same time the number of fishermen over age 50 increased and the number of younger fishermen decreased (FAO, 2012; and Statistical Data, p. 3). However, these trends may be reversing as younger fishermen return in response to new economic opportunities created by the tourism development of fishing villages (Cheong, 2005).
- *Chronic overexploitation of marine resources.* A majority of the fishing stock is classified as exploited, over-exploited, or depleted (see graphs, pp. 11-12), despite the fact that a climatic regime shift in the Japan/East Sea around 1976 increased the weighted

mean trophic catch level from 3.09 to 3.28, thereby increasing the total biomass of species groups by 15% and total catch production by 48% (Zhang, et al., 2004).

Assessment of SES Robustness:

As a result of various international agreements entered into by the South Korean government since the 1990s, the institutional framework within which fisheries management was embedded for the past fifty years has expanded to include not only the fishing village cooperative structure observed by Han (which underwent fundamental restructuring over the years), but also various other voluntary input (Self-Management System (SMS) and Fish Stock Rebuilding Plan (FSRP)) and one output control strategy (Total Allowable Catch (TAC)). Although fishery household incomes have improved, it is uncertain whether these management strategies, individually or combined, will lead to the recovery of the marine ecosystem and a more robust SES due to the following:

1. Ineffective monitoring, sanctioning, and lack of legal enforcement mechanisms prevail in all currently implemented fisheries' management systems.
2. The seemingly haphazard implementation of the various input and output control measures, which all operate simultaneously without any interconnectivity, makes it difficult to assess the overall impact of the individual policies on each other and the SES as a whole.
3. All management techniques appear to place an emphasis on the management of economically viable marine species with little apparent input from independent sources, such as marine conservation groups, marine biologists, etc., to evaluate the impact of fisheries on the overall marine ecosystem.
4. According to the Food and Agriculture Organization of the United Nations (FAO), South Korea does not keep records of its fisheries' bycatch making an accurate assessment of fishery impacts on the entire marine ecosystem even more difficult.
5. The use of maximum sustainable yield harvesting numbers (TAC and FSRP) fosters the continued overexploitation of commercially viable species.
6. Financial and administrative support provided only to select "model" villages in the SMS leads to an inequitable distribution of funding and unfair advantages to the model communities, resulting in resentment and lack of incentive to participate in villages not so chosen.
7. While the responsiveness and adaptiveness that is derived from the strong bottom-up/top-down influence exerted in the SMS model communities has led to some successes, it is uncertain whether the government intends to expand this model to all fishing communities and/or whether it intends to continue this particular governance method long-term.
8. An ecosystem-based fisheries management (EBFM) scheme is now being proposed. Scientific studies reviewed are vague with regard to whether EBFM will be launched separately from the management schemes currently in operation, or whether it will be a supplement to existing techniques. Moreover, the literature raises concerns that the EBFM will again only address those ecosystem elements that deal with commercially viable species, instead of analyzing fishery impacts on the marine ecosystem as a whole.

II. HISTORICAL CONTEXT

Chosun (Yi) Dynasty (1392 to 1910) (see Cheong, 2001)

- A majority of the fishing grounds were privately owned by royalties and local landlords who extracted taxes from fishermen for harvesting marine resources. Later on, government authorities would also claim ownership rights to the fishing grounds resulting in double-taxation of fishermen.
- Fishermen, whose low income prevented them from being eligible for bank loans, were forced to turn to *kaekju* (middlemen) to obtain loans to buy boats and fishing equipment. *Kaekju* loan contracts mandated that fishermen sell their entire harvest to the *kaekju* at prices fixed well below market value. This led to a domination of the fisheries market by the *kaekju*, who maintained near monopolistic control over fishery products and their distribution channels (Han, 1972; Cheong, 2004).
- In order to protect themselves from exploitation, fishermen organized themselves in *gye* (or *kye)* systems – voluntary, informal, rotating credit clubs which collected membership dues from the fishermen, and then invested that money to collectively purchase expensive fishing equipment.

Japanese Occupation (1910 to 1945) (see Cheong, 2001)

- Implementation of Japanese Meiji law and restructuring of Korean fisheries beginning in 1911.
- Meiji law established fishing rights, fishery resource protected areas, and fisheries cooperatives.
- Fishing ground privatization was revoked, and the colonial state had the exclusive right to grant: (1) right of access to fishing grounds to fishing cooperatives; and (2) individual fishing licenses to fishermen.
- Fishing cooperatives delegated the exercise of fishing rights to their members.
- Fishing rights were handled like private goods which could be sold, inherited, and transferred, as long as the colonial government approved.
- State had ownership rights to fishing grounds.
- Fisheries cooperatives were in charge of resource management.

Post-Colonial Period (1945 to 1962) (see Cheong, 2001)

- The post-colonial government adopted much of the colonial legacy. Accordingly, the first fisheries law enacted in 1953 (after the Korean War and division of the country) provided for government control over fishing licenses and established fishing village cooperatives to manage local resources.
- Cheong asserts that the 1953 Fisheries Law refined fisheries rights, strengthened protected resources, and gave more control over local resources to the cooperatives.
- This "democratization" of the fishing operation allowed for the settlement of management issues by fishermen themselves, and freed fishermen from the economic control of absentee owners, village elites, and middlemen (*kaekju)* to whom fishermen owed debt.
- The establishment of a national cooperative paved the way for a cooperative-controlled distribution system that established cooperative fish markets in eight cities formerly controlled by the *kaekju*, thereby allowing the cooperatives to eliminate the *kaekju* and

sell their products directly to end consumers while reducing distribution cost to its members.

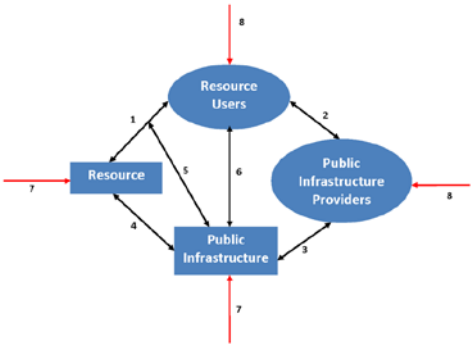
- ❖ According to Cheong, this system created a two-sided influence on the socio-ecological system – the state exerting influence from the top down, and the cooperatives from the local level (bottom) up which, combined, created a well-integrated fisheries management system.
- ❖ The strong local autonomy of the fishing cooperatives also meant that the cooperatives were free to operate independently of the national cooperative in response to external crises, such as income decline or resource depletion. This would prove to be a strength as well as a weakness.
- ❖ Communities that did not have established fishing cooperatives (such as Kagodo island) were subject to continued exploitation by the *kaekju* (Han).

III. KEY DATA UPDATES

This section provides data updates on the key elements of the SES robustness model (Anderies, et al., 2004) as it pertains to the Korean fisheries SES.

Resource

Exogenous impacts on resource:



1. Technological advances since the 1970s (global satellite positioning systems, sonar, etc.) allow fishing fleets to track, follow, and catch all fish of all sizes, year-round. "Trawlers vacuum the seafloor of ground fish" (Cheong, 2001).
2. Massive tidal land reclamation efforts converting coastal areas into agricultural and industrial land removed large portions of coastal ocean habitat (total targeted reclamation area by 2011 equals 2,622 km^2) negatively impacting the main fishing grounds of coastal fishermen (Cheong, 2001).
3. Extensive marine pollution due to oil spills, waste discharges (industrial and residential), and aquaculture waste (Cheong, 2001).
4. Climatic regime shift (CRS) in the Japan/East Sea around 1976 which increased the weighted mean trophic catch level from 3.09 to 3.28. This resulted in an increase in the total biomass of species groups by 15% and total catch production by 48% (Zhang, et al., 2004).

Effects on Resource:

- ❖ All four major types of fishing (distant water, coastal water, aquaculture, and inshore fishing) experienced a rapid increase in productivity in the 1970s, followed by a gradual increase in the 1980s, and all have been declining in output since the 1990s (Cheong, 2003). Ryu, et al. (2006) report the depletion of fishing stocks in coastal and off-shore waters due to overfishing and indifferent management by fishers and government since the mid 1970s. Lee, K.N., et al. (2006), advise that stock depletion and enforcement problems persist even after implementation of various fisheries' management tools over the course of the past 50 years. Lee, S.G. (2010) acknowledges further fish stock

depletions since 2000. All of this despite an increase in weighted mean trophic catch levels since 1976, as reported by Zhang, et al. (2004).

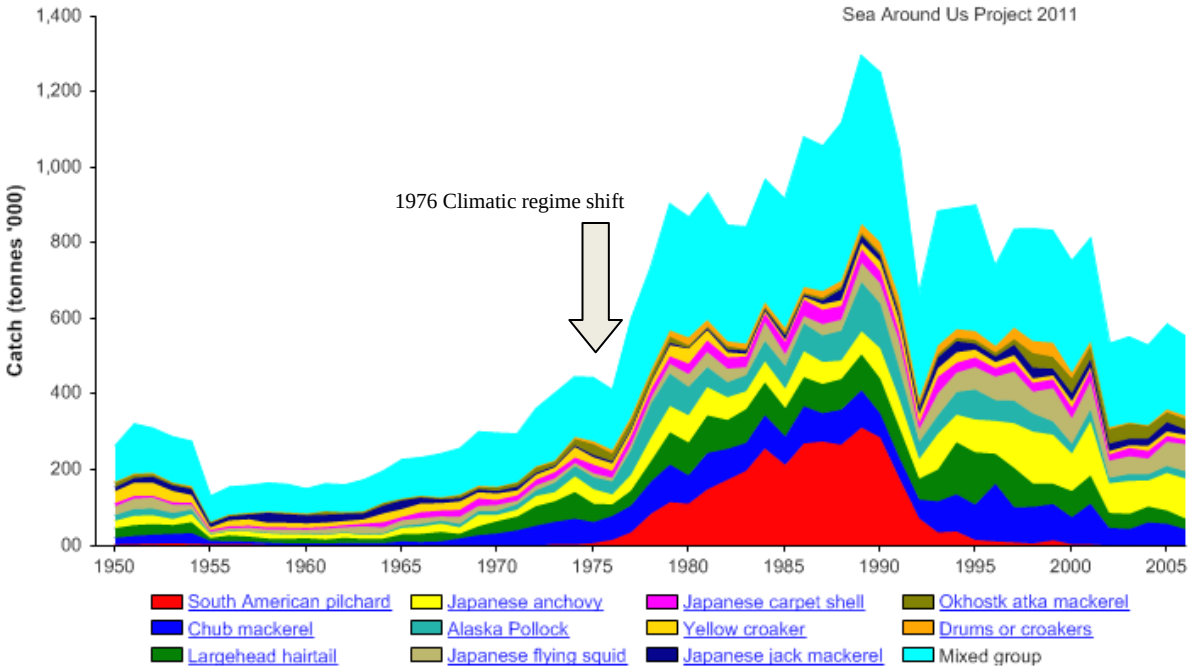
- From 1955 to 2001, fish stock depletion became evident in the decline of commercially valuable species, such as the semi-demersal red sea bream (*Pagrus major*) that occupies an ocean depth range of 10 to 200 m (Fishbase: *P. major*, 2012), leading to its replacement with the commercially lower valued semi-demersal hairtail (*Trichiurus lepturus*) found usually at depths between 100 to 350 m (Fishbase: *T. lepturus*, 2012) (Cheong, 2003). This despite the fact that Zhang (2004) reports that the biomass of semi-demersal fish in Korean waters increased by 49% since 1976.
- Over the past 40 years, small pelagics constituted 51.9% of the total annual catch in Korean waters of the Japan/East sea, and that percentage has increased recently. Since small pelagics are an important food source for numerous predators and serve as an ecosystem link between upper and lower trophic marine levels, the long-term marine ecosystem effects due to their depletion is unknown (Zhang, 2004).
- The overexploitation of the marine habitat is further evidenced by reports that fish caught since the 1990s are on average younger than two years of age and much smaller in size than the average fish caught in the 1970s and 1980s (Cheong, 2003).

The following data inconsistency should be noted: Contrary to the above literature which seems to indicate a reduction in South Korean ocean productivity, the FAO's 2009 *Fisheries and Aquaculture Report* describes an annual increase in capture levels since 2004 for fish, crustaceans, mollusks, etc. (FAO, 2011). Furthermore, South Korean government statistics report an increase in fishery catch of 141 thousand tons (4.5%) between 2010 and 2011 (Preliminary Results Fishery, 2012), although capture numbers remain significantly lower than the 10 million tonnes caught in 1980 and 7.9 million tonnes caught in 2004 (Lee, S.G., 2010) (*Note: it is assumed that both measurements (tonnes/tons) are based on the metric unit of measurement, 1 ton = 1,000 kg, but this could not be verified in the literature*).

Recent Developments:

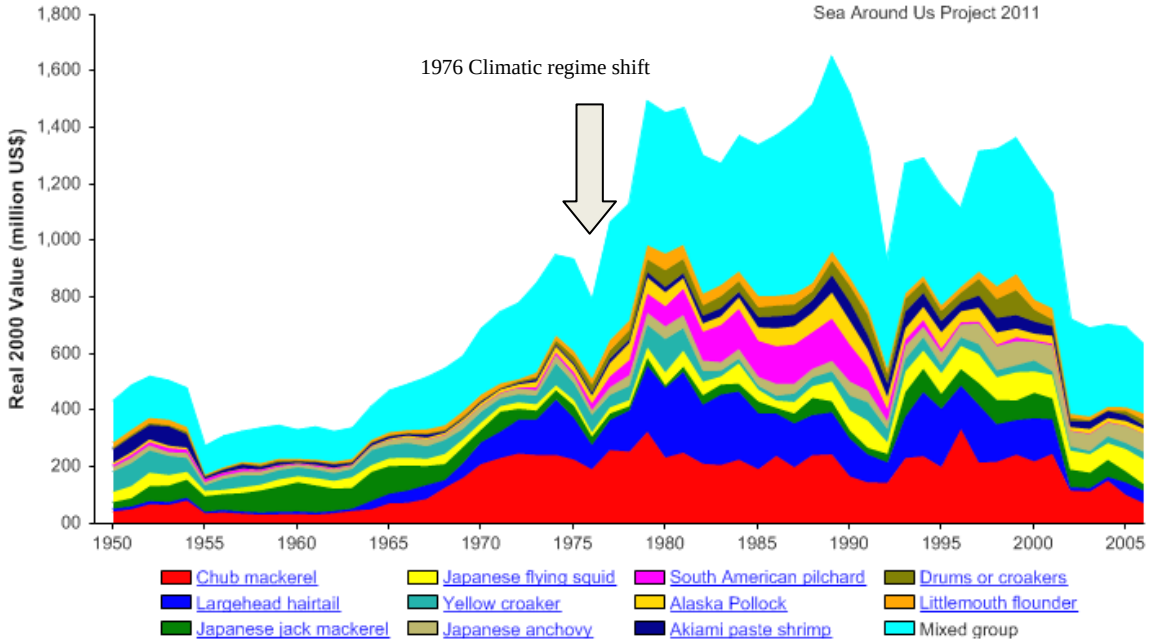
- Movement towards an ecosystem-based assessment of fishery resources and their habitats (EBFM), including ecological interactions of target species with the abiotic and biotic elements of their marine habitat, and the effects of fishing on those processes (Zhang, et al., 2009).

Landings by species in the waters of Korea (South)



Source: Adapted from the Sea Around Us Project
http://www.seaaroundus.org/eez/410/1.aspx

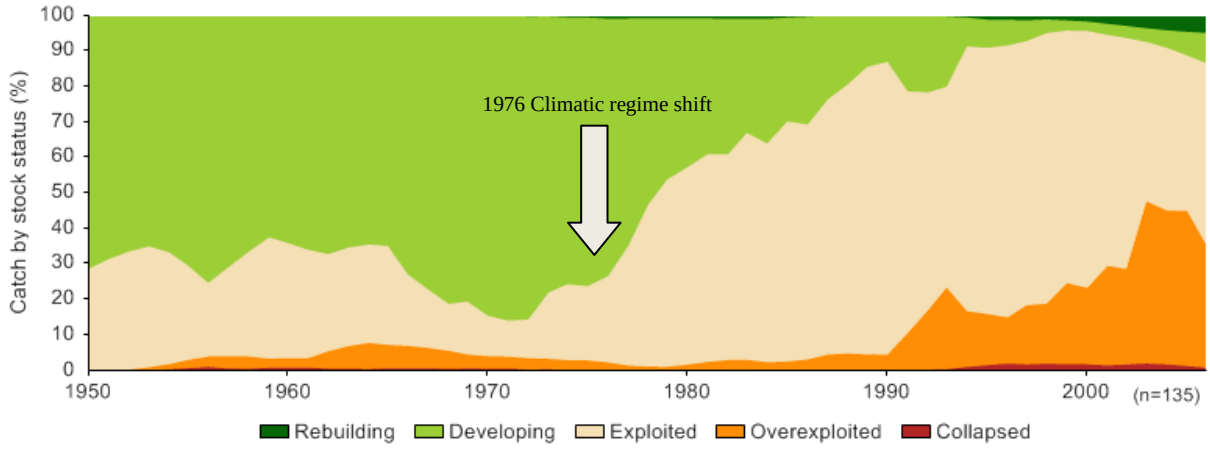
Real 2000 value (US$) by species in the waters of Korea (South)



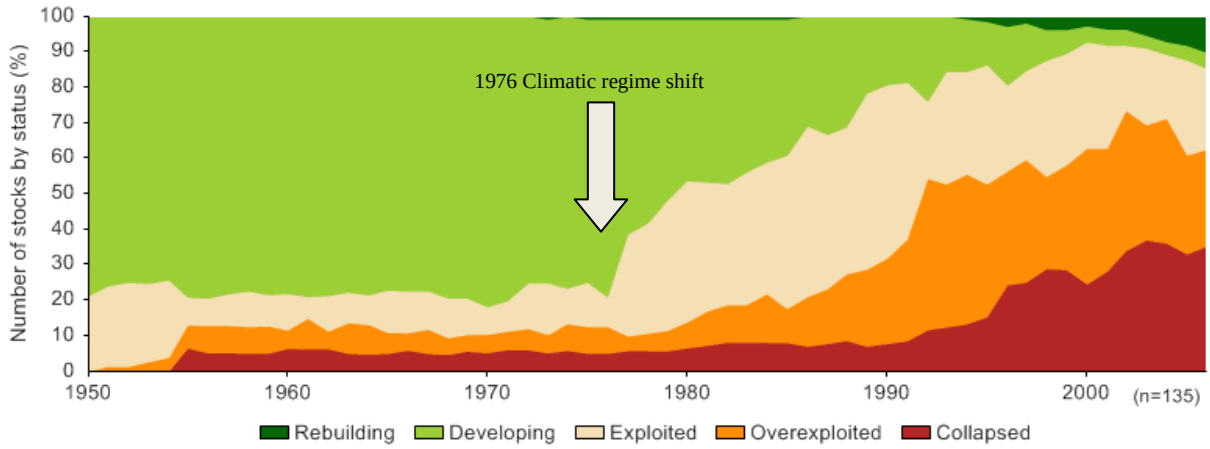
Source: Adapted from the Sea Around Us Project
http://www.seaaroundus.org/eez/410/11.aspx

Stock status in the waters of Korea (South)

Percentage of catches from stocks of a given status



Percentage of stocks of a given status



Source: Adapted from the Sea Around Us Project
http://www.seaaroundus.org/eez/410/101.aspx

Stock status plots assess the status of stocks by catch biomass (3-year running average values; top) and by number of stocks (bottom) since 1950.

Stock-status categories are defined using the following criteria (all referring to the maximum catch [peak catch] or post-peak minimum in each series): **Developing** (catches ≤ 50% of peak and year is pre-peak, or year of peak is final year of the time series); **Exploited** (catches ≥ 50% of peak catches); **Over-exploited** (catches between 50% and 10% of peak and year is post-peak); **Collapsed** (catches < 10% of peak and year is post-peak); and **Rebuilding** (catches between 10% and 50% of peak and year is after post-peak minimum). Note that (n), the number of 'stocks' is defined as a time series of a given species, genus or family (higher and pooled groups have been excluded) for which the first and last reported landings are at least 10 years apart, for which there are at least 5 years of consecutive catches and for which the catch in a given area is at least 1000 tonnes.

Resource Users.

The following SES elements affect resource users' decision-making processes at the operational level:

Exogenous impacts on resource users:

1. Changes in international sea boundaries and governmental land reclamation projects reduced the size of coastal fishing areas increasing resource competition among fishermen (Robinson, 2011; Cheong, 2001 and 2003);
2. New global regulations mandated an increase in international trade of fishing products causing a rise in demand and drop in price of fish stocks (Robinson, 2011);
3. Availability of enhanced technological fishing methods increased the average catch size of an increasingly industrialized fishing fleet that robs the resource before it can reach coastal waters which are the main fishing areas for small-scale fishermen.

Other factors affecting resource users:

- Korean society is relatively homogeneous in its ethnic makeup (The World Factbook, 2012). However, fishing communities consist of actors that are heterogenous based on varying characteristics, such as family lineage, wealth, age, and years of residence within the community (Cheong, 2005).
- Korean households rely on fish for a significant portion of their nutritional needs. The average Korean consumes more than 44 kg (nearly 100 lbs) of fish annually (Cheong, 2003). FAO data indicates that a continued rise in personal income is expected to boost the per capita demand for fish to an estimated 60 kg/year (over 130 lbs) in 2010 (FAO, 2003). These consumption rates far exceed the FAO reported global per capita consumption of fish which in 2007 was estimated at 17.8 kg (approx. 40 lbs) (FAO, 2011).
- Economic hardship (reduced fishery productivity and drop in fish stock prices due to global competition equals reduced income). In 1993, the FAO reported that fishermen's annual family income was approximately $18,000, far below that of agricultural families. At the same time, the average debt of fishing families in 1993 reached about $9,600, an increase of 18.1% from the prior year. As a result, 32.5% of family fisheries household income is derived from other income sources (OECD, 1997 qtd. in FAO, 2012).
- Rising operating costs (for fishing equipment, fuel, etc.) (Robinson, 2011).
- Rising cost of living expenses (Robinson, 2011).
- Outmigration of fishermen resulting in a significant drop in population size of fishing communities (Cheong, 2003 qtd in Robinson). The total number of households and number of women employed in marine fisheries has also been decreasing, and the proportion of fishermen older than 50 years of age is rising (FAO, 2012; The Summary of Results, 2004).

Effects on resource users decision-making:

The above listed elements greatly influence fishermen's decision-making processes leading them to take actions that further their personal interests to the detriment of overall SES robustness, such as illegal fishing and overharvesting of fish stocks.

Recent Developments:

- *Improved economic conditions for fishery households.* After many decades of significant economic disparity between fishery households and the rest of the Korean population, 2011 economic data indicates that the average annual fishery household income has

improved and now is only approximately 10.4 million won/year (approx. U.S. $9,000.00/year) less than the average national annual household income (see Statistical Data, p. 3).

- The outmigration of fishermen and the aging of the fishermen population may be reversing as younger fishermen return in response to new economic opportunities created by the tourism development of fishing villages (Cheong, 2005).
- However, the government-funded and local/corporate-led trend to convert fishing villages to tourism destinations is also creating conflicts between generations and between new and established residents (Cheong, 2005).

Public Infrastructure Providers.

The chronic depletion of fish stocks and the lack of socio-economic improvement for fishermen and their families have led to the following decision-making processes of public infrastructure providers at the collective-choice level in the SES:

Village Cooperatives.

Generally (Cheong, 2001)

- Fishermen had to join local village cooperatives to gain access to commonly-held fishing grounds – membership was based on various rules, such as minimum residency requirements and minimum days spent fishing.
- It was illegal for non-members to enter and/or fish in the common fishing ground. **Exception -** non-members, who lived in the village for a year or more, were qualified to exercise fishing rights to the common fishing ground, if they obtained consent from the local cooperative and reported as fishermen.
- No formal monitoring and sanctioning procedures evident in the literature.
- The cooperative delegated the operation of the fishing grounds to its members. In exchange, members paid a certain percentage of revenue to the cooperative.
- Fishing ground management rules were established at the annual general assembly of the cooperative which required the presence of more than half of the members.

Changes occurring from 1972 to present (Cheong, 2001 and 2004)

Various changes to fishing rules and regulations in the 1970s and 1980s gave fishing cooperatives near autonomous power over the fishing resources. This led to an increasing movement towards privatization of the common pool resource in order to mitigate the effects of fishing stock depletion and the resulting economic losses and labor out-migration:

- Illegally leasing access to their common fishing grounds to non-members. This led to significant reporting discrepancies with fishing cooperatives reporting one or more members fishing in a section of the commonly-held fishing ground on paper, while in reality numerous non-members were exercising leased access rights to the resource. In many cases, this resulted in a loss of actual knowledge of resource extraction rates, productivity, and profitability.
- Leasing of fixed net fishing rights and aquaculture sites to the highest outside bidder due to fishing cooperatives' lack of capital and/or skill to manage these particular harvesting methods. This led to further privatization of the resource, absentee ownership, and monopolization of resources by outsiders, whose main interest was short-term capital gains, not the long-term viability of the resource.

Other Factors Affecting Fisheries Cooperatives

- Heterogeneous interests of cooperative members led to internal politics based on individual needs, instead of decision-making in the best interest of the resource and the community, including, but not limited to, the muzzling of the "development of an egalitarian and representative democracy" by local elites (Cheong, 2005).

Recent Developments

- *Tourism development of some fishing villages*. Some fishing village cooperatives are working with the government and/or corporations and granting access to their fishing grounds to tourists for sightseeing and sports fishing. In other instances, the government/corporate-led conversion of fishing villages to tourist destinations is creating conflicts between village cooperatives and business owners (Cheong, 2005).
- *Self Management System (SMS) and Fish Stock Rebuilding Plans (FSRP).* As of 2007, 579 fishing village communities have volunteered to participate in the government's self-management system (SMS/FSRP) which is purportedly successful in some fishing villages.

Government.

The Korean government has exclusive ownership rights to its marine resources and, in doing so, legally establishes the coastal habitat as a common pool resource. The government grants right of access to the common pool resource by extending the following different types of cooperative fishing rights to fishing cooperatives:

TYPES OF COOPERATIVE FISHING RIGHTS

Fishing Rights Licenses	Types	Content
Fixed net	Large (more than 10 ha) Medium (5 ha–10 ha) Small (under 5 ha)	Catch fish using fixed fishing gear in a confined water space, e.g., anchovy, hairtail
Cooperative Aquaculture (formerly, common fishing ground)	Seaweed Shellfish Fish Mixed Cooperative	Cultivate shellfish using seabed or providing necessary underwater Facilities
Village fishing ground (formerly, common fishing ground)		Cultivate, catch, and gather shellfish, seaweed, or sedentary marine fish

Source: Adapted from Hwang (1998) qtd. in Cheong, 2004

Aside from the fishing rights above, from approximately 1962 to the mid 1990s, the South Korean government's fishery management system also included:

- Input control measures
  - Limiting/controlling fishing licenses – rights of access to resources (see Table 1 above); and
  - Gear and vessel restrictions – limiting extraction rights of the resource.
- Technical measures
  - Size and sex selectivity measures of species harvested; and
  - Time and area closures to fishing grounds.
- Vessel buy-back program.

Since the late 1990s, the government has added the following resource control elements:

- Output control measures (TAC system for 9 – 10 species and 5 fisheries) implemented in 1998 (Ryu, et al., 2005).
- Self-control management project/system (SMS) implemented in 2001 (Lee, K.N., et al., 2006).
- Fish stock rebuilding plan (FSRP) combined with conventional fish stock enhancement programs implemented in 2005 (Lee, S.G., 2010).

The Korean government also provides three types of subsidies for fishing villages:

1. National government-supported fishing village comprehensive plan (10-year plan) which provides a certain subsidy to every fishing village annually. In 2010, 200 fishery corporations (28.7% of total fishery corporations) received a total of 317 million won in subsidies (Preliminary Results, 2011).
2. Ministry of Maritime Affairs and Fisheries' (MOMAF) provides financial support for the investment in small fish distribution centers, storage, or other infrastructure helpful to fishermen.
3. Fisheries cooperative bank which provides individual or fishing village cooperative projects with funding at a lower interest rate. In 2010, 102 fishery corporations (14.6% of total fishery corporations) received a total of 402 million won in government loans (Preliminary Results, 2011).

Decision-making processes over time:

- ***1945 to 1975*** – Democratization and collective operation (which eliminated the exploitative *kaekju*) under a hierarchical government system (top-down) with cooperatives at the national, regional, and local level.
  - According to Cheong (2001), this created a two-sided influence on the socio-ecological system – the state exerting influence from the top down, and the cooperatives from the local level (bottom) up which, combined, created a well-integrated fisheries management system.
  - The strong local autonomy of the fishing cooperatives also meant that the cooperatives were free to operate independently of the national cooperative in response to external crises, such as income decline or resource depletion.
- ***1976 to late 1990s*** – Cessation of government control and devolution to local governance with limited government involvement (bottom-up);
- ***2000s to present*** – variety of policies, including traditional fishing cooperatives (bottom-up); SMS/FSRP (voluntary hybrid top-down/bottom-up), and TAC system (top-down).

Public Infrastructure.

International Laws

The 1994 United Nations Convention on the Law of the Sea (UNCLOS) is an international treaty that binds ratifying nations to certain behaviors related to marine resources based upon the acknowledgment that marine resources are valuable to all nations. Among other items, UNCLOS governs the following:

> The living resources (i.e., fish, shellfish, sea turtles, and marine mammals) provisions of the LOS Convention [which] recognize[s] international interdependence on these resources and provide[s] a framework for their cooperative and sustainable management. These provisions, comprising Articles 61 through 73, deal specifically with:
>
> • conservation (Article 61),
> • exploitation (Article 62),
> • transboundary and straddling stocks (Article 63),
> • highly migratory stocks (Article 64),
> • marine mammals (Article 65),
> • anadromous stocks (Article 66),
> • catadromous stocks (Article 67),
> • sedentary species (Article 68) …
>
> (Buck, 2011).

Countries who are signatories to UNCLOS, such as South Korea which became a signatory in January 1996, agree to abide by the guidelines within the Treaty. Accordingly, many of the South Korean national policies are modeled after elements of UNCLOS (Liu, et al., 2012). In fact, the TAC, SMS, and FSRP management systems were all added **after** South Korea became a UNCLOS signatory and are likely a direct response to the Treaty.

It should be noted that, like all international treaties, there is no international legal authority that polices state activities, and there is no international court before which cases can be brought and tried. Part XV of UNCLOS (*Settlement of Disputes*) outlines that the states have an "obligation to settle disputes by peaceful means in accordance with Article 2, paragraph 3, of the Charter of the United Nations Charter," but the implementation and enforcement of the laws and regulations adopted with the Treaty lies with the individual states (Oceans and Law, 2001).

Fisheries Agreement between Korea, Japan, and China (Rosenberg, 2005)

The agreements for cooperative fisheries management in the East China Sea were executed by South Korea and China and Japan in 1997 and 1998, and have been in effect since 2000 and 2001, respectively. The agreements address three key issues:

1. Reaffirmation of each nations' exclusive rights over fishery resources and fishing activities in its own EEZ;
2. Establishment of reciprocal fishing access in each others' EEZ; and
3. Cooperative management regime for shared fishery resources.

The agreements led to a diminishment of each country's traditional fishing grounds resulting in the need to reduce the size of fishing industries and to create compensation funds for fishermen facing unemployment as a result of implementation of these agreements.

Limitations of the agreement: The agreements do not cover the entire fishery system leaving unregulated waters subject to future disputes. Moreover, the agreements provide only little transparency and accountability with no public participation or dispute settlement mechanism to redress grievances.

World Trade Organization (WTO) and the Asia Pacific Economic Cooperation (APEC)

The guidelines under both of these agreements increased competition in the fishing industry and called for a removal of all fishing subsidies (Cheong, 2001). Additionally, APEC called for a removal of tariffs on fish and fish-related items by 2005, and the removal of subsidies and non-tariff barriers by 2007. Under these agreements, the Korean government also agreed to provide 82% of its fish market to the world.

National Laws:

1962 Fisheries Cooperative Law

The South Korean national government implemented a top-down/bottom-up fisheries management structure by establishing three cooperative organizations:

1) National fisheries cooperative – servicing credit and financing through cooperative banking. The state exercised control over local cooperatives by appointing the president of the national cooperative, giving subsidies, and enacting cooperative regulations;
2) Regional fisheries cooperatives – 66 regional fisheries cooperatives responsible for selling fishermen's products; training fishermen; giving loans, and managing fishing rights.
3) Korean *Euchon Gye* (fishing village cooperatives) – 1,722 village cooperatives which were affiliated with the regional cooperatives and responsible for the management of the commonly-held local fishing grounds. Fishing village cooperatives were responsible for:
    i) Extending loans to members;
    ii) Supplying necessary goods;
    iii) Providing common services to members (storage, processing and sales of fish harvested; establishing facilities, such as moorage, slipways, and artificial reefs; welfare services; and education in fishing management techniques).

(Cheong, 2001).

Revisions Implemented in the 1970s and 1980s

Over time, the 66 regional cooperatives were overwhelmed by the management/supervision of 1,722 village cooperatives and, as a result, their role diminished to one of financier and fish product distributor. Several revisions to the 1962 Fisheries Cooperative Law in the 1970s and early 1980s transferred near autonomous control over fishery resources to the local cooperatives, cutting out any influence and power the regional cooperatives had over local fishing village cooperatives:

- 1972 Revision – allowed fishing cooperatives to bypass the regional fisheries cooperatives and obtain their fishing licenses directly from the national fisheries cooperative.
- 1975 and 1977 Revisions – gave priority to fishing village cooperatives over regional cooperatives regarding the management of common fishing grounds and aquaculture sites.
- 1981 Revision – mandated that if an individual's fishing right in the fishing common expired; the village cooperative was given the priority to manage that right. This

regulatory revision also transferred more management tasks to fishing village cooperatives.

- By the 1980s, there were only two remaining links between the local fishing cooperatives and the regional cooperative which were circumvented or abolished as follows:
  - In order for fishermen to become members of local fishing village cooperatives, they first had to become a member of the regional cooperative – this rule was circumvented by local cooperatives who refused to accept a fisherman unless he/she signed up with them first. This rendered the rule a formality, not a requirement.
  - Fish report system that required fishermen to report and sell their catches to the regional cooperative – this rule was abolished with the 1981 Revision allowing fishermen to catch whatever they wanted and sell to whomever they chose.

These rules weakened the checks and balances in the system making fishing cooperatives independent resource managers without any oversight by the regional cooperatives. The system which was designed as a two-way, top-down/bottom-up, system was thereby effectively restructured to a decentralized local system with little to no government oversight (Cheong, 2001).

Institutional Changes in the 1990s to 2000

Cheong (2001) outlines the following institutional changes in the 1990s:

1. Slowdown of state interventionist policies in economic development after the Asian financial crisis in the mid 1990s;
2. Devolution of power from central to local governance through the Local Autonomy Act of 1990 – authority to issue fishery permits was transferred from metropolitan mayors and provincial governors to small city mayors, county and district chiefs; and local management practices were shifted to the control of fishing village cooperatives;
3. 1996 restructuring of all ocean-related government agencies into one integrated marine ministry, the Ministry of Maritime Affairs and Fisheries (MOMAF);
4. 14th Amendment to the 1962 Fisheries Law in 1995 which converted common coastal fishing grounds into village fishing grounds and cooperative aquaculture. This change shrank the size and depth of fishing grounds (now generally only five meters in depth). The state government also relaxed the membership requirement rule to village cooperative fishing grounds allowing non-members access to cooperative fishing grounds, as long as they had permission from the cooperative;
5. Special Law on Fisheries Support of 1999 provided financial assistance to fishermen who suffered losses due to the new fishing agreements with China and Japan and fostered international competitiveness within the fisheries sector.

Beginning in the 1970s through the late 1990s, the South Korean government implemented various types of funding schemes for fishing village projects, including village development projects, financial assistance, special taxes and other subsidies, to prevent outmigration and foster collective resource management in the fisheries sector. According to Cheong, none of these funding programs brought about the desired economic or ecosystem improvements because the money was provided directly to the cooperatives without any regulations or stipulations attached to them. As a result, the cooperatives could use the funding as they saw fit and, in response to acute labor shortages, used the money to increase the privatization of their village fishing grounds (2001).

Institutions 2000 to present

Contemporary Korean fisheries management systems consist of a variety of regimes, including the fishery cooperatives outlined above as well as the following:

Total Allowable Catch (TAC) System (Output Control) (Ryu, 2005; and Robinson, 2011)

- Implemented in 1998 in response to UNLOS and Fisheries Agreement with China and Japan;
- Limits the total catch amount per species for nine to ten marine species with high volume and high commercial value which require conservation measures and which are transboundary species subject to harvesting conflicts with neighboring nations.
- Based upon the set TAC limits, individual quota allocation certificates are distributed to fishermen;
- TAC numbers are set by negotiations between the government and the fishing industry and are based loosely on maximum sustainable yields;
- Fishermen self-report catches to sellers and distributors who in turn report up the institutional chain;
- Monitoring of catches by 12 observers in 7 landing ports.

Problems with TAC:

- Since implementation of TAC, all TAC target species have further declined.
- No input by independent organizations without a financial stake in the system (marine conservation NGOs, independent academics, etc.), and no input from individual fishermen directly affected by the allocation quotas.
- Increasing disputes between fishermen and the government.
- Accuracy of reporting system questionable – one-line system with no cross-checking of data between sellers and fishermen.
- Not enough observers to effectively monitor landing ports.
- Current TAC management system fails to consider effect of high bycatch rates of TAC species in other fisheries.

Fish Stock Rebuilding Plan (FSRP) (Lee, S.G., 2010)

- Implemented in 2005 in response to UNLOS and Fishing Agreements with Japan and China.
- Stakeholder participation encouraged (fishermen, academics, government, researchers, NGOs, etc.) who can participate in establishing, executing, and evaluating basic plans.
- Claims to be an ecosystem based approach to fisheries management.
- Development and implementation of FSRP is conducted by a newly organized government science committee and a fishery resource management committee (FRMC).
- Development of fish stock rebuilding plans for fish stocks that are overexploited/depleted, and a management plan for fish stocks with decreasing numbers.
- Management of individual fish species based on the status of those species.
- FSRP to be linked with community SMS.

Problems with FSRP

- Evaluation of stock recovery based on maximum sustainable yield (MSY).
- Requires only voluntary participation by fishermen.
- Restrictions on targeted recovery stocks due to FSRP fishing limitations and restrictions may cause economic losses to fishermen and reduce voluntary participation/induce violations.

- Lack of data on true causes of fish species depletion limits the effectiveness of recovery plans.
- FSRP neglects to address the effects of marine pollution on fish stocks.

Self-Control Management System/Project (SMS) (Lee, K.N., et al., 2006)

- Implemented in 2001 to "induce responsible behavior by fishermen" through:
  - The alleviation of conflict and increased communication between different fisheries;
  - The fostering of voluntary participation in sustainable fisheries;
  - Increase fishermen's income;
  - Development of fishing communities.
- Decentralized governance model.
- Three types of SMS
  - Fishing village community (I)
  - Fishing gear community (aquaculture) (II-1)
  - Coastal and offshore fishery (II-2)
  - Large-scale community (III)
- 579 fishing communities participating since 2007 (Lee, S.G.).
- Various fishery groups develop fishing regulations for SMS and create a fisheries committee. The committee plans and implements the SMS.
- The Ministry of Maritime and Fisheries (MOMAF) provides administrative, legal and technical support.
- Local governments supervise the implementation of the SMS, identify model communities and promote those model communities to other fishing villages.
- "Model communities" receive special financial and administrative support as an incentive for participation in SMS (A+ = 1000 million won for one community; A = up to 500 million won each for two communities; and B+ = 2 million won each for 45 communities).
- Communities not selected as model communities receive no funding and only limited administrative support.
- Fishermen and the central government share the planning, implementation, and enforcement of fisheries rules and regulations.
- SMS actively addresses fishing stock management, as well as social and environmental issues confronted by fishing communities.
- Model communities showed a 95% participation level in local governance.

Problems with SMS

- Selection process to determine the A+/A/B+ communities has the potential to lead to infighting and jealousy among participating communities.
- Documented lack of participation in SMS communities not selected as model communities.
- Administrative, financial and technical support is only provided to the "model" communities.
- Government only provides incentives for fishermen participation at the beginning stage to induce voluntary participation and cooperation, without government oversight, later.
- Unknown whether SMS has reduced illegal fishing.
- Fishing communities with older members experience a greater amount of problems developing community solidarity and developing rules and regulations.

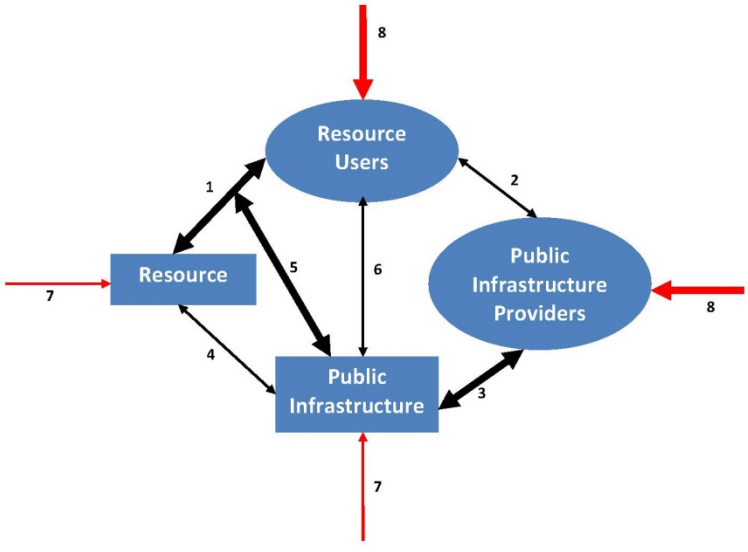
- ❖ Fishing regulations and stock enhancement efforts require money and time which communities that do not receive financial assistance do not have.
- ❖ Depending on community dynamics, certain communities still have members not following regulations creating community conflict.
- ❖ Voluntary program – no enforcement provisions/legal deterrence.
- ❖ No conflict resolution mechanisms.

IV. EMERGING PATTERNS

Fishing Cooperatives (1945 to approximately the mid 1970s)

The 1953 Fisheries Law and the subsequent 1962 Fisheries Cooperative Law provided for the collective operation of local fisheries under a hierarchical government system with cooperatives at the national, regional, and local levels. In many aspects this fisheries' management system mirrored the colonial Meiji law implemented by the Japanese from 1911 to 1945. In order to gain access to commonly-held fishing grounds, fishermen had to become members of a local fishing cooperative. Under the guidance and supervision of regional cooperatives, these fishing cooperatives were free to manage their local fishing grounds as they deemed fit, as long as they abided by the government fishing rights. They were also able to settle management disputes by themselves. More importantly, the establishment of the national and regional cooperatives freed the cooperatives from the economic control of absentee owners and the *kaekju* (middlemen). The institutional framework so established created what Cheong (2001) called a well-integrated fisheries management system which exerted influence from the top-down and the bottom-up. The system also provided cooperatives with the authority to act independently from the government in cases of external crises, such as income decline or resource depletion.

Although the structure of the SES through the early 1970s appeared well-integrated, even Han (1972) noted that the influence by outside market forces was significantly changing fishing village socio-economic structures (link 8 – resource users). Although the cooperative structure freed the fishermen from financial servitude to the *kaekju* and provided them with direct access to fishery markets (link 8 – public infrastructure providers), this financial freedom also resulted in greater outside influence on fishing villages. Instead of fishing for subsistence, fishermen were now fishing for economic profit. This drive for economic profits, in combination with technological advancements in fishing gear and methods, led to the increasing exploitation of commercially valuable marine species (link 1).



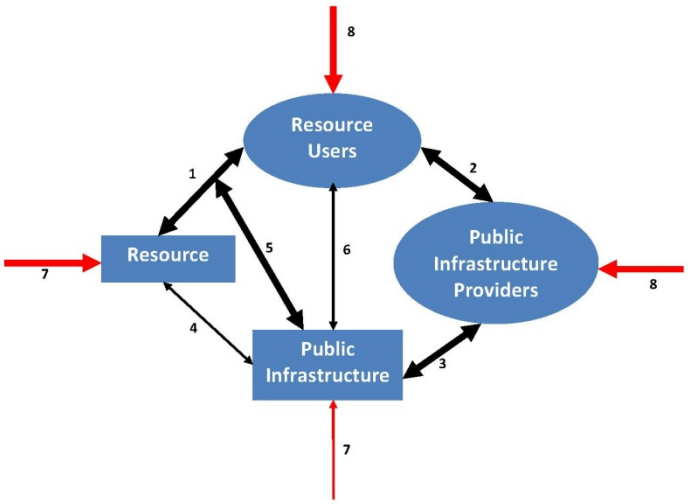
Applying Ostrom's (1990) design elements to this SES structure reveals that fishermen were able to take advantage of the economic opportunities created by outside market forces because the cooperative structure did not provide for an effective monitoring or legal enforcement system to prevent the overharvesting of marine resources, i.e., the cooperative

structure rewarded decision-making that favored short-term profits over the long-term viability of ocean ecosystems. This design flaw translated into weaknesses in links (3) and (5) in Anderies' (2004) robustness model which facilitated resource overharvesting (link 1) when outside market influences promised fishermen and fishing cooperatives greater economic gains (external force on link 8).

Fishing Cooperatives (1970s through late 1980s)

In 1976, a climatic regime shift (CRS) in the Japan/East Sea led to a long-term increase in total marine biomass by approximately 15% and facilitated an increase in total catch production of approximately 48% (external force on link 7). At the same time, technological advances (GPS, sonar, etc.) led to the increasing industrialization of the fishing industry with commercial fishing fleets nabbing many commercially viable species out at sea before they reached coastal areas (link 7). Due to population growth, lack of agricultural land, and a drive towards economic development (link 8), the South Korean engaged in massive tidal land reclamation projects which converted vast areas of coastal ocean habitat into industrial and agricultural land (links 7 and 5). The resulting loss of inshore fishing grounds and industrial and agricultural pollution of the remaining ocean habitat significantly impacted marine resources and fishing villages (links 7 and 5).

During this time period, the central government also took an increasingly laissez-faire approach to fisheries management as evidenced by a series of revisions to the Fisheries Law, which significantly diminished the role of the regional cooperatives by transferring near autonomous power over fishery resources to the local cooperatives (link 3). This eliminated the remaining oversight and authoritative power of the regional cooperatives, including the requirement for fishermen to report and sell their catches to the regional cooperatives.



With the top-down link between the government and the fishing village cooperatives severed, control, management, and supervision of the resource was now monopolized within the cooperatives. Although the 1976 CRS resulted in an increase in marine productivity, the impacts of ocean pollution, loss of fishing grounds due to tidal land reclamation, and the competition with an industrialized fishing fleet, negatively impacted local fishing grounds. In response to decreased catch sizes, economic losses, and subsequent outmigration of fishermen (link 8), village cooperatives used their decision-making autonomy to illegally privatize village fishing grounds by leasing access rights to outsiders for economic profit. With no government oversight (link 5), and with no monitoring or legal enforcement of sanctions for overharvesting by fishermen and outsiders (link 2), the marine ecosystem continued to decline despite the increase in ocean productivity due to the CRS (link 1).

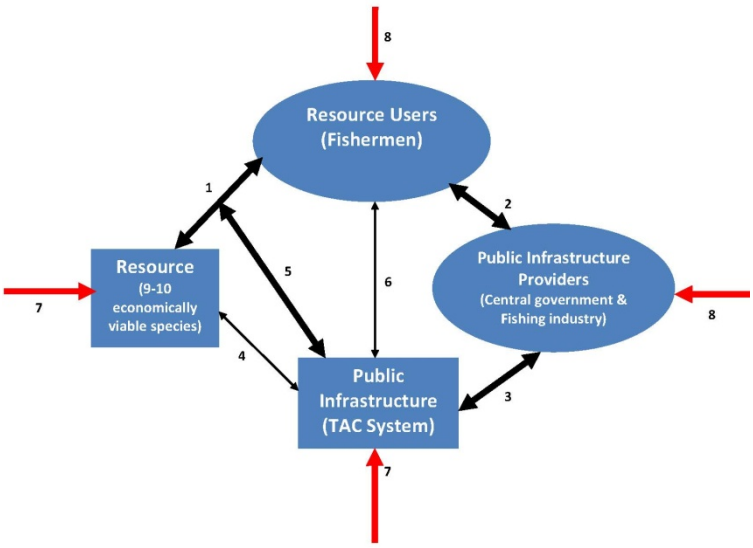
Fishing Cooperatives (1990s to present)

During this time period, changes to national fisheries laws and regulations signaled an even greater commitment by the central government towards a devolution of power from national to local governance of fisheries resources as evidenced by the Local Autonomy Act of 1990. At the same time, South Korea also became a signatory to various international agreements/treaties which impacted national fisheries management. It should be specifically noted that South Korea's commitment, under WTO and APEC agreements, to export 82% of its fishery products to the global market place, along with a vast national demand for fish, has conceivably led to an increase in marine extraction that far outpaces CRS-created marine productivity. The institutional changes implemented in the 1990s in response to a variety of international treaties and agreements has led to the enactment of the following fisheries input and output control systems, all of which remain in effect today, and which have the following impacts on the SES:

Total Allowable Catch (TAC) SYSTEM (1998 - present):

TAC is South Korea's only output control system. For further details about TAC, see "Institutions 2000 to present" (p. 20). Applying the elements of TAC to Anderies' robustness model reveals the following:

The marine resources are being affected by global climate change, pollution, and related ecosystem decline (link 7). At the same time, international and national demand for fishery products is high, and fishermen depend on marine resources for their economic welfare (link 8). The government, as one of the public infrastructure providers, is guided by economic concerns for the welfare of fishermen, but is also influenced by the short-term financial interests of the fishing industry (link 8). Moreover, TAC rules and regulations were guided by a desire to avoid conflicts with neighboring nations and to abide by UNCLOS conservation measures (link 7). However, by unilaterally setting quota allocations without including independent stakeholders (marine conservation NGOs, academics, etc.) and fishermen, who are uniquely dependent on the long-term viability of the resource, in the decision-making process creates a weakness in the SES (link 2). This weakness, combined with the lack of effective monitoring and enforcement of TAC limits and the failure to include bycatch data (links 3 and 5), results in further overexploitation of marine resources, as evidenced in the unabated depletion of TAC species (Ryu, 2005).

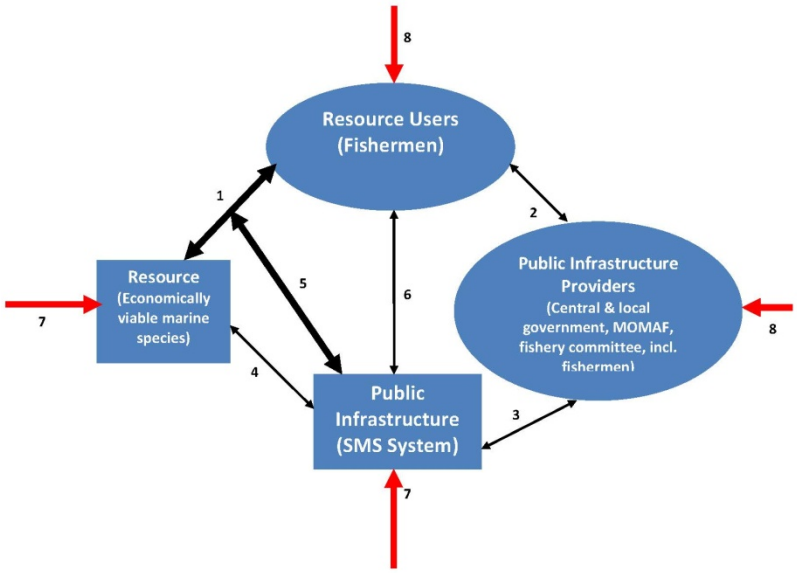


Self-Management System(SMS) (2001 to present)

SMS is a voluntary input control system. For further information on SMS, see "Institutions 2000 to present" (p. 21-22). It should be noted that the application of SMS by the government is divided into two institutional formats based on whether a fishing community is deemed to be a

"model" community or not. Model communities receive extensive financial and administrative support from the government which in essence sets up a consistent feedback between the government and the model fishing community (hybrid top-down/bottom-up governance system) that is adaptive and very responsive to local socio-economic change. In contrast, the non-model fishing communities receive no financial and only limited administrative support. Applying the elements of these two SMS to Anderies' robustness model reveals the following:

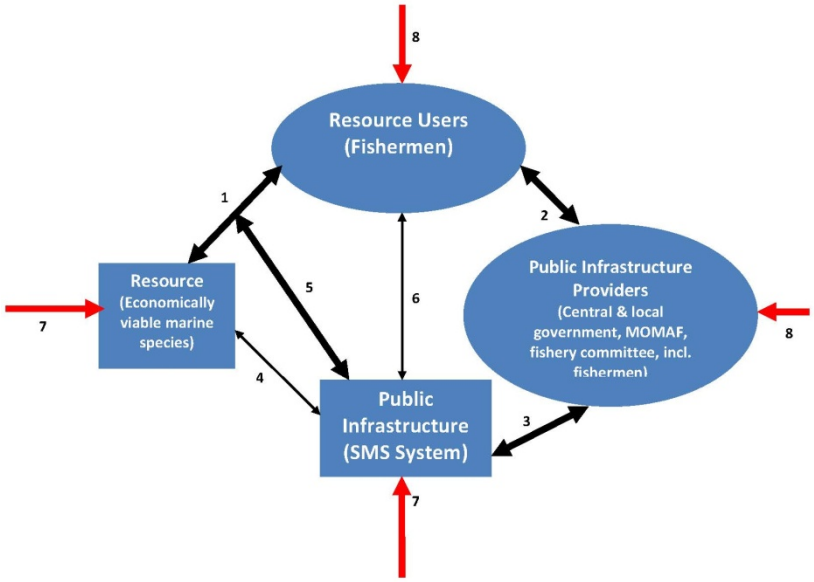
SMS model community:



The external influences on the SES are identical to the TAC system, except that link 8 influencing the public infrastructure providers is more guided by a concern for the overall welfare of fishing communities and marine resources. The SMS system itself is guided by international agreements, particularly the Fisheries Agreement with Japan and China. Since there is continuous communication between the government and the fishing communities/fishermen which, if necessary, results in adjustments to the public infrastructure/institutions, this system is very adaptive to change resulting in what appears to be an improvement upon the 1945 to mid-1970s cooperative structure. The only weakness in this SES is its voluntary nature which results in a lack of effective monitoring and legal deterrence (link 5) which, under the right conditions, can foster the continued overharvesting of resources (link 1).

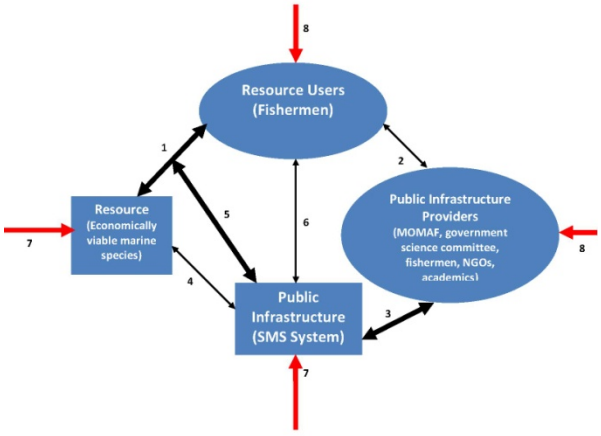
SMS non-model community:

It is evident from the robustness model that the absence of financial and administrative support in non-model SMS fishing communities leads to an exacerbation of SES weaknesses diminishing the overall robustness of the SMS model. Non-model SMS communities lack the support that comes with the continuous communication and feedback between local and government levels, and they lack the financial incentive to engage in a strictly voluntary program. As a result, weaknesses in links 2 and 3, lead to an increase in individual



decision-making that favors short-term personal gains over long-term ecosystem viability leading to overexploitation of marine resources (link 5).

Fish Stock Rebuilding Plan (FSRP) (2005 to present)



FSRP is a voluntary program implemented in response to UNCLOS and the Fisheries Agreement with Japan and China. For further information on FSRP, see "Institutions 2000 to present" (p. 20-21). FSRP is designed as a supplemental program to SMS to specifically target the recovery of fish stock that is overexploited and/or depleted. Although the development of FSRP is conducted by the government with input from all stakeholders, the foundation of the program, which is based upon maximum sustainable yield data of economically viable fish species, is flawed because it fails to address the effects of overfishing/select fish stock replenishment measures on the marine ecosystem as a whole. Moreover, as a voluntary program, it has no legal enforcement power (weakness in links 3 and 5) which increases the likelihood that fishermen will ignore any fishing restrictions of protected species if the same are likely to adversely affect them economically (weakness in link 1).

New Developments.

Ecosystem-based fisheries management system (EBFM). As with all of the other fisheries management schemes developed and implemented since the 1990s, EBFM is being proposed as a direct result of international agreements. Specifically, the ecosystem approaches to fisheries management outlined in the International Council for the Exploration of the Sea (ICES) and the North Pacific Marine Science Organization (PICES) to which South Korea is a member. In response to these proposals, in 2009, the South Korean government defined a "Vision for Korean Fisheries" which included first and foremost "rebuilding fishery resources based on an ecosystem approach" and a focus on the sustainable use, protection, and conservation of marine resources (Zhang, 2009).

The elusiveness of the government's stated goals notwithstanding, Zhang and his team tested a model EBFM on a marine ranch and a large purse seine fishery. Although the outcome of that study revealed uncertainties regarding the effectiveness of EBFM, Zhang advocates implementing this model in addition to the already existing fisheries management schemes outlined above under the theory that the benefits of EBFM will outweigh any unintended consequences from additional human activities on marine ecosystems.

Tourism development in fishing villages. Cheong (2001, 2003, and 2005) discusses extensively the positive and negative aspects of tourism development in fishing villages. Depending on the social and demographic dynamics of the individual communities, in some instances, this has led to the economic revitalization of marginal communities with greater economic prosperity and a return migration of fishermen. In others, however, it has led to conflicts between fishing cooperatives and business owners.

V. SUMMARY/CONCLUSION

South Korea's 1962 Fisheries Cooperative Law provided a bifurcated (top-down/bottom-up) system in which national, regional, and local fisheries cooperatives formed strong links and exerted influence on each other. In doing so, an institutional system was created that provided the restructuring adaptability necessary to react to exogenous change- a major component for a long-enduring SES. Although there are likely other reasons for the system's failure to prevent overexploitation of marine resources, one of its major weaknesses was the lack of consistent monitoring and legally enforceable graduated sanctions for those violating extraction rules. Instead of analyzing and improving the institutional design weaknesses, the South Korean government spent the past fifty years chasing the purported virtues of local governance by morphing the bifurcated fisheries cooperative system into a decentralized system that gives near autonomous power to local cooperatives. How much that faith in decentralized governance is based on international influence is unclear. What is clear, however, is that, despite a 1976 climatic regime shift that turned the Japan/East Sea surrounding South Korea into one of the most productive fisheries in the world, catch sizes and marine ecosystem health in the region have significantly declined nearly simultaneously with the devolution of institutions.

Since the late 1990s, under the guidance of various international treaties and agreements, and in response to the continued decline in catch sizes and the deteriorating economic conditions in fishing villages, a variety of new fishing management schemes have been implemented to stave off further SES deterioration. All of these fisheries management systems continue to exhibit the same design defect as the 1962 fisheries cooperatives, i.e., the lack of an effective monitoring and legal enforcement system. Moreover, with the exception of SMS model communities, none of the fisheries management techniques display the bifurcated system that exerts the top-down/bottom-up influence necessary to quickly adapt to exogenous change. Even for SMS model communities, the literature strongly indicates that the bifurcated aspect of the system may only be temporary until the government determines that communities can self-manage their resource again, at which time the government may likely retract and allow the system to devolve back into local governance.

Despite the aforementioned criticism of the South Korean fisheries' management systems, the government's strength lies within its willingness to respond and adapt its institutions to combat deteriorating social and ecological conditions in its fisheries. Even though it has deployed a multitude of fisheries management schemes in a seemingly haphazard manner, it should be noted that economic conditions for fishery households have improved, and some commercially important fish stocks appear to be rebuilding. It would greatly behoove the South Korean government if, instead of emulating every internationally induced panacea – from the virtues of local governance to ecosystem-based "management" – it would look to its own history to determine the institutional elements that made its fisheries' SES robust in the past. It might just find that the original 1962 fisheries cooperative system, once properly analyzed and modified to eliminate design weaknesses, could provide the adaptability, intra-, inter-generational, and interspecies equity that is key to long-term SES robustness.

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