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SOS 494
December 13, 2011

Road to sustainability: The development of Korean fisheries management.

Abstract

This paper examines the development of Korean fisheries management up to the current Self-Management System (SMS), and then compares the SMS with two earlier systems to identify three key characteristics that allow the SMS to achieve more sustainable outcomes: 1) collective choice rules that include local users, 2) a robust communication and network infrastructure, and 3) targeted financial incentives. The analysis also looks at how the lack of official sanctioning weakens SMS effectiveness in certain communities.

Introduction

In the past several decades, one of the most widespread sustainability challenges to appear is the overharvesting of ocean fisheries. I use the term "sustainability challenge" to refer to a class of decision problems that deal with resolving issues of intra-generational, inter-generational, and/or inter-species equity; and are characterized by collective action dilemmas, complexity and uncertainty in social-ecological systems (SES), and the potential for strong non-linearities, critical thresholds, and irreversibility (Anderies et al, 2011). The prevalent cases of overfishing taking place in oceans around the world are text-book examples of such sustainability challenges. These are situations that involve multitudes of actors interacting with extremely large and dynamic resource systems that are difficult to monitor and protect from adverse use, and the collapse of these fisheries would result in long-term consequences for current users, future generations, and ocean eco-systems. In order to combat the problems of overfishing, countries around the world are attempting to implement or improve management of their fisheries, with varying levels of success. In recent years, Korea, whose fisheries have been experiencing dropping production levels starting in the 1980s, has been able to achieve progress in reducing overfishing and improving system sustainability (e.g. minimizing/eliminating intra-generational, inter-generational, and inter-species inequities) by introducing a new Self-Management System (SMS) for their fisheries. In this paper, I analyze the SMS and try to identify some key characteristics that have enabled this system to achieve better results than Korea's earlier fishery management efforts, as well as examine a weak area within the SMS that could still be improved. However, before I begin my analysis, I provide in the next section a brief historical overview of Korean fishery management development.

Background

Since 1908, the primary fishing management regime utilized in Korea was a system of fishing licenses and technical regulations (Ryu et al, 2006). There were two types of fishing licenses issued: fishing rights and fishing permits. Fishing rights were assigned to fishing

cooperatives, which were organizations that were originally established by the government, and granted the cooperatives the right to operate in specific coastal fishing grounds. Meanwhile, fishing permits were issued to individual fishing vessels and their operators for offshore fishing activities. Small-scale fishing of insignificant value using simple fishing gear did not require a license, only that the fishermen submit a report of their catches to local officials (Cheong, 2001). The technical regulations involved restrictions on the type of fishing gear and size of vessels that could be used based on the type of fishery (Ryu et al, 2006).

Once they were in possession of the appropriate fishing licenses, and as long as they obeyed the technical regulations, fishermen were given relatively little oversight by the government. This was especially true of fishing cooperatives, which were allowed considerable leeway on how they could manage their assigned fishing grounds. This freedom would increase as the cooperatives, which started out as large national and regional organizations, began to be decentralized into smaller local village cooperatives starting from 1962. Over time these small local cooperatives were given more and more freedom to manage their fisheries, to the point that many began acting independently of the larger cooperatives and some even began overstepping government regulations (Cheong, 2001). This isolation from outside connections would prove to be detrimental in the long run for the local cooperatives and their communities.

Beginning in the 1970s, Korean fisheries began to suffer from issues of resource depletion from overfishing, with catch per unit of energy (CPUE) decreasing since the mid-1970s and total catches decreasing since the mid-1980s (Ryu et al, 2006, Figure 1). There were several overlapping factors that caused the overfishing by fishermen: changes in international sea boundaries increased resource competition by reducing the area where Korean fishermen could fish, new global regulations that increased trade with foreign markets causing fishing prices to drop and demand to increase, and technological advancements that enabled fishermen to increase how much fish they could catch. In addition to the overharvesting, a national policy of land reclamation (converting shallow water areas to arable land) that destroyed fishing grounds and caused water pollution also contributed to a decrease in fishery output (Cheong, 2003).

The depletion of their fisheries, causing increased competition and rising costs, brought the fishermen increased economic hardship. However, due to their isolation from the government and other cooperatives, many local cooperatives had little support to overcome the pressures that were causing them to overharvest their fisheries. As resource depletion continued, and fisherman income did not increase at the same rate as other occupations, fishermen and their families, especially the younger generation, were enticed to leave their communities for better jobs in the cities. This led to significant out-migration from fishing communities, with fisherman populations dropping from 323,000 in 1980 to 173,000 as of 1998 (Cheong, 2003). This trend debilitated many Korean fishing communities, leaving them short on labor and stunting community development

Some fishing communities attempted to resolve their income and labor issues by opening their fishing grounds to tourism or illegally leasing access to private sector businesses, such as commercial fishermen. Some communities achieved success with these methods, but these coping strategies often led to additional problems, like conflicts between fishermen and tourists or further degradation of local fishery resources by outside users (Cheong, 2003).

Seeing the decline of fishing communities, in 1988 the Korean government started implementing revitalization projects to rebuild fishing communities. These projects had two components: hard infrastructure development, such as building roads and fishing support facilities, and income generating investments given to local cooperatives. The infrastructure

development was carried out by the government, while the investments were provided directly to the fishing cooperatives to use for community development, such as tourism facilities. However, while the infrastructure development did help the communities, the investments did not achieve the desired results as the cooperatives lacked the finance and business skills to properly manage the investments (Cheong, 2003). Also, as these projects did not directly address the issue of overfishing, resource depletion of the Korean fisheries was continuing unabated.

After the failure of their initial revitalization projects, the Korean government recognized the inability of the decentralized local fishing cooperatives to adapt to the challenges facing them, as well as the need to for more direct action to prevent overfishing. The government decided to recentralize fishery management; and beginning in 1998 started implementing a Total Allowable Catch (TAC) system for selected species and fisheries. Under the TAC system, a limit was set on the total amount of catch per species that could be caught each year, and then quota allocation certificates were distributed to individual fishermen. The fishermen were supposed to report their catch amounts to sellers and distributors, who in turn reported the totals to government officials, who would announce when TAC limits were being approached. To insure reporting compliance government-hired observers were placed at landing sites to monitor catch amounts (Ryu et al, 2006). However, ultimately this system was also limited in effectiveness. Because they had no input into the TAC system, fishermen viewed the system negatively. The use of the TAC system led to increasing disputes between fishermen and government officials. Additionally, proper monitoring and enforcement for the system was difficult, resulting in a significant increase of illegal fishing (Lee et al, 2006). These issues would lead the Korean government to develop a new project, the Self-Management System (SMS).

The Korean government began testing the SMS in 2001 with 63 volunteer communities and has expanded the number of participating communities to 579 as of 2007 (Lee, 2010). The premise of the system is that fishing communities voluntarily choose to join the program and self-manage their fisheries in exchange for government support and assistance. The system is designed to target fish stock management as well as social and environmental issues surrounding the fisheries. The structure of the system has the fishing community members form a committee to select and implement management plans and regulations, while government agencies provide financial, administrative, and technical assistance to the communities, with government liaisons assigned to each community. Local government, regional government fishery offices, and research institutions supervise the implementation of the project by monitoring the progress of participating communities, as well as advertising the program to recruit more communities into the program (Lee et al, 2006, Figure 2).

The results of the SMS are promising, with many communities effectively implementing resource management plans, such as seasonal closures of fishing grounds, limiting days at sea, stock enhancement via stocking seedlings, etc. Some communities have reached above 95% active participation rates from community members. These successful communities are showing fish stocks that are stabilizing and recovering, with production increasing significantly within a couple years of starting the program in some communities. However, not all communities have achieved the same level of success. In these cases the attributes of the communities, such as internal conflicts between members, or lack of sufficient government support has made the program less effective in these communities (Lee et al, 2006). Nevertheless, the SMS has proven to be a more successful model of sustainable fishery management than the systems that preceded it.

Methods

For my analysis of the Self-Management System, I will compare it with the two fisheries management systems that preceded it: 1) the decentralized system of independently acting local cooperatives and 2) the recentralized fisheries management efforts under the Total Allowable Catch system. The analytical basis that I utilize to carry out this analysis is a combination of the Institutional Analysis and Development (IAD) framework, and a framework developed by Elinor Ostrom for the use of analyzing social-ecological system (SES) sustainability (Ostrom, 2009). A brief description of these frameworks is offered below.

IAD framework is a conceptual model for social systems and provides tools to analyze and breakdown institutions into their fundamental components, such as boundary or authority rules. Ostrom's SES framework divides a SES into four core subsystems that affect each other, as well as influencing other linked social, economic, political and ecological systems. The subsystems are 1) resource systems (e.g. fishing grounds), 2) resource units (e.g. fish), 3) governance systems (e.g. fishing regulations and governing entities creating and enforcing those regulations), and 4) users (e.g. fishermen). Each core subsystem is comprised of numerous second-level variables which in turn breakdown into deeper-level variables (Ostrom, 2009, Figure 3). The framework also categorizes the types of interactions between the core subsystems and possible outcomes.

Using the terms and concepts laid out by the above frameworks as a foundation, I attempt to identify the notable characteristics of the SMS that make it more sustainable than the two earlier fishery management systems. First I isolate the characteristics that separate the SMS from the earlier stages of Korean fisheries management. Next, I examine how these attributes changed the interactions within the Korean fisheries' SES and resulted in more sustainable outcomes. Finally, I use the frameworks to examine a remaining weak area in the SMS and offer potential solutions.

Analysis

Key characteristics

The first characteristic that is notable about the SMS system is its collective choice rules (GS6), as it is the local resource users (i.e. the ones most affected by regulations) themselves who set the authority and scope rules (e.g. when and how often users can fish) for their fishery. This leads to the creation of operational regulations (GS5) that are well-tuned to the specific needs of the users and local resource system of each community, as the actors who are most familiar with the resource system and community attributes are the ones enacting the rules. The result is that users are more willing to accept the regulations and adhere to them, as they feel more invested in upholding regulations they had a role in shaping. This is compared with the top-down regulation of the TAC system, where disconnected actors (e.g. government officials) made regulations that did not take into account each community's unique attributes and situation, and resulted in users viewing the system negatively as they had no say in the rule making process (Lee et al, 2006). However, what is especially interesting about the SMS's use of collective choice is how it is differs from the usage of collective choice in the decentralized local cooperatives. The decentralized cooperatives also gave users the ability to create their own authority and scope rules, much like in the SMS. What differentiates the two systems is presence

of outside actors (e.g. government officials, scientists) monitoring the performance of community enacted regulations. In the case of the decentralized cooperatives, there was little oversight of how effective each community was at properly managing their fishery. This led to many communities possessing outdated rules that were ineffective at dealing with new emerging issues. However, the performance of the communities participating in the SMS are constantly monitored by various government agencies and research institutes, and private consultants are sent to poorly performing communities to help them improve their management, whether it is by enacting additional rules or adjusting implementation (Lee, 2010). This focus on creating locally attuned rules and closely monitoring the progress of communities has clearly played an important role in the successful implementation of the SMS.

The next noteworthy characteristic is the SMS's information rules (e.g. how information is shared among actors) and communication infrastructure (GS3) which facilitates open dialogue (I8) and information sharing (I2) between the various actors and levels. Communities participating in the SMS are provided considerable informational support via the private consultants mentioned earlier and government servicemen who are appointed to each community by the Fisheries office to provide guidance and advice (Lee, 2010). Besides acting as important information sources for the communities, the presence of these servicemen also means that there exists a direct communication link between the individual communities and the government. Additionally, an information network has been set up between the various communities so that important information is freely shared, such as fish prices and successful management techniques (Lee et al, 2006). Finally, when conflict arises between the communities or with other actors, conferences administered by private firms, acting as impartial third-parties, are held to resolve disputes (Lee, 2010). All of this results in the actors having an increased understanding of the system (U7) and are able to make well-informed decisions, coupled with improved relations between the various actors, leading to more sustainable and equitable outcomes. This is in stark contrast to the earlier systems. In the case of the decentralized cooperatives, the communication infrastructure between the government and the cooperatives, as well as between the cooperatives themselves, had degraded to the point that there was little interaction taking place. This meant actors often made decisions while lacking important information, leading to sub-optimal results. As for the TAC system, while there was communication infrastructure in place, it was only used to transmit data on fish catches and how much fishermen were allowed to harvest, with no real dialogue taking place between the various actors. This limited communication did little to improve relations between actors, and only led to increased conflict. By improving communication, the SMS has been able to greatly increase the cooperation and effectiveness of Korean fishery management efforts.

The final notable characteristic I examine is the government investment (I5) and payoff rules (e.g. incentives or fines) in the SMS that shape fishermen decision-making. In the beginning stage of the SMS, when a community first joins the program, communities are provided with financial assistance and incentives to encourage voluntary participation in the program. While all participating communities at this stage receive some form of financial assistance, the best performing communities are given significantly larger financial awards (Lee et al, 2006). Besides acting as incentives, the financial assistance offsets the initial economic losses that the communities suffer when they enact their new management plans, caused by set up costs and lowered income from reducing catch amounts. This initial funding plays an important role in changing user performance measures, as it eases the economic pressure on the fishermen (U2), making it easier for them to make the individual decision to reduce how much

they fish. These kind of targeted incentives were non-existent in the earlier fisheries management systems. While the decentralized cooperatives did receive government financial aid via revitalization projects, there were no payoff rules to encourage better practices on part of the cooperatives. As for the TAC system, there was no government investment being provided to fishermen, and the payoff rules for the system consisted of fines for the fishermen that disobeyed the TAC quotas. This use of an incentivizing investment structure has allowed the SMS to greatly improve user participation.

Remaining weak area

One of the major premises of the SMS is the fact that it consists of voluntary participation by the fishermen and the communities. While this quality certainly produces positive aspects, such as fishermen being much more accepting of the program verses a program that was forced upon them, it also produces one of the system's weaknesses. As following the regulations produced by SMS is entirely voluntary, there is no official method of sanctioning the users who disobey the regulations. What results is that the effectiveness of the SMS in a specific community is highly dependent on the social attributes of that community (U6). When a community has high levels of social capital (e.g. the community members have close social ties and possess a strong shared vision), the SMS efforts in that community are usually very successful as the community members show high participation in the collaborative management. However, in the cases of communities with low social capital (e.g. poor relations between community members, lack of shared vision), implementation of the SMS was less effective, as certain members would not follow the regulations and would produce community conflict (Lee et al, 2006). In order to resolve the lack of participation in communities with low social capital, I see two possible solutions. The first solution is the communities in question need to take steps to improve social ties and strengthen social norms between community members. This can be done through social activities that bring community members together and informal social sanctioning against the community members who disobey the regulations. However, these communities may not have sufficient existing social capital or leadership to carry out this type of solution. The second solution is to develop official sanctions that target violators, such as fines, confiscation, or incarceration. However, this solution would essentially mean the end of the voluntary nature of the SMS, as well as entail additional logistical costs. But if no mechanisms are developed to deal with regulation violators, then the SMS will continue to have issues of limited success in certain communities.

Conclusions

After examining the Korean Self-Management System and comparing it with previous fishery management systems, I have identified three characteristics that stand out as contributing to the SMS success: 1) collective choice rules designed to produce locally attuned and effective operational regulations, 2) a robust communication and network infrastructure between various levels, actors, and communities that facilitates information exchange and open dialogue, and 3) financial incentives that shape user performance measures and encourage participation. As for issues that still remain for SMS, not all communities have the same level of success due to community attributes and the lack of clear sanctioning caused by the voluntary nature of the program. Nevertheless, the progress that has been made by the SMS shows its promise. Because

of the SMS, Korean fishing communities have been able to achieve more sustainable management by improving intra-generational equity (by reducing conflicts between actors), inter-generational equity (by reducing overfishing and preserving important fishery resources for future generations), and inter-species equity (by developing management techniques that consider overall ecosystem health). However, besides the SMS characteristics I have identified, in my analysis I noticed another characteristic about the Korean fisheries that I believe plays the largest part in why they have become more sustainable: the responsiveness of the Korean government. As issues of overharvesting became apparent, the reaction of the government was quite swift as they quickly began instituting policies to combat it. But even more admirable is how quickly the government seems to recognize when policies are ineffective and implement new policies. Due to this responsiveness, the Korean fisheries management has been able to quickly go through a process of trial and error development to achieve considerable progress in a short amount of time. And this progress is still ongoing as the Korean government continues to tweak and add to Korean fishery management, such as designing and implementing Fish Stock Rebuilding Plans (FSRP) meant to integrate with the SMS (Lee, 2010). It is only through this kind of active and adaptive responsiveness that sustainability challenges can be overcome and is in my opinion the most important characteristic for a social-ecological system to have.

Figures

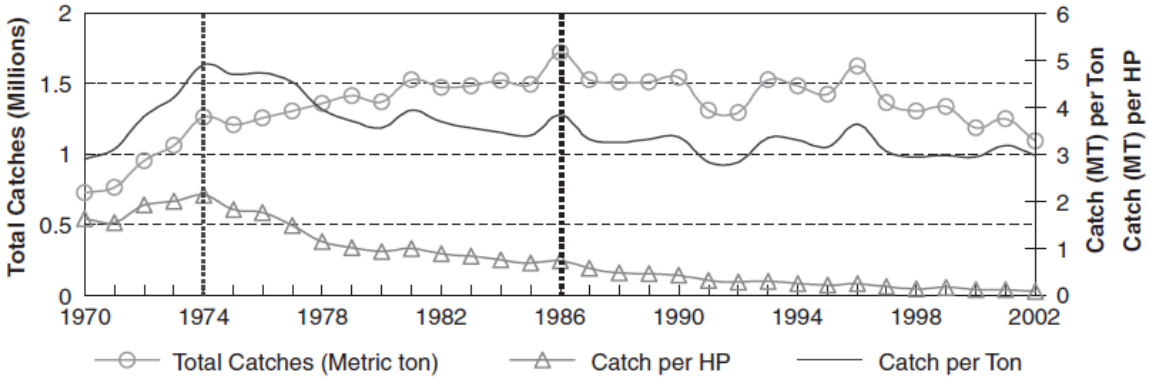

Figure 1. Trends in total catches and CPUE indices (Ton and HP); 1970-2002. Source: Ryu et al, 2006

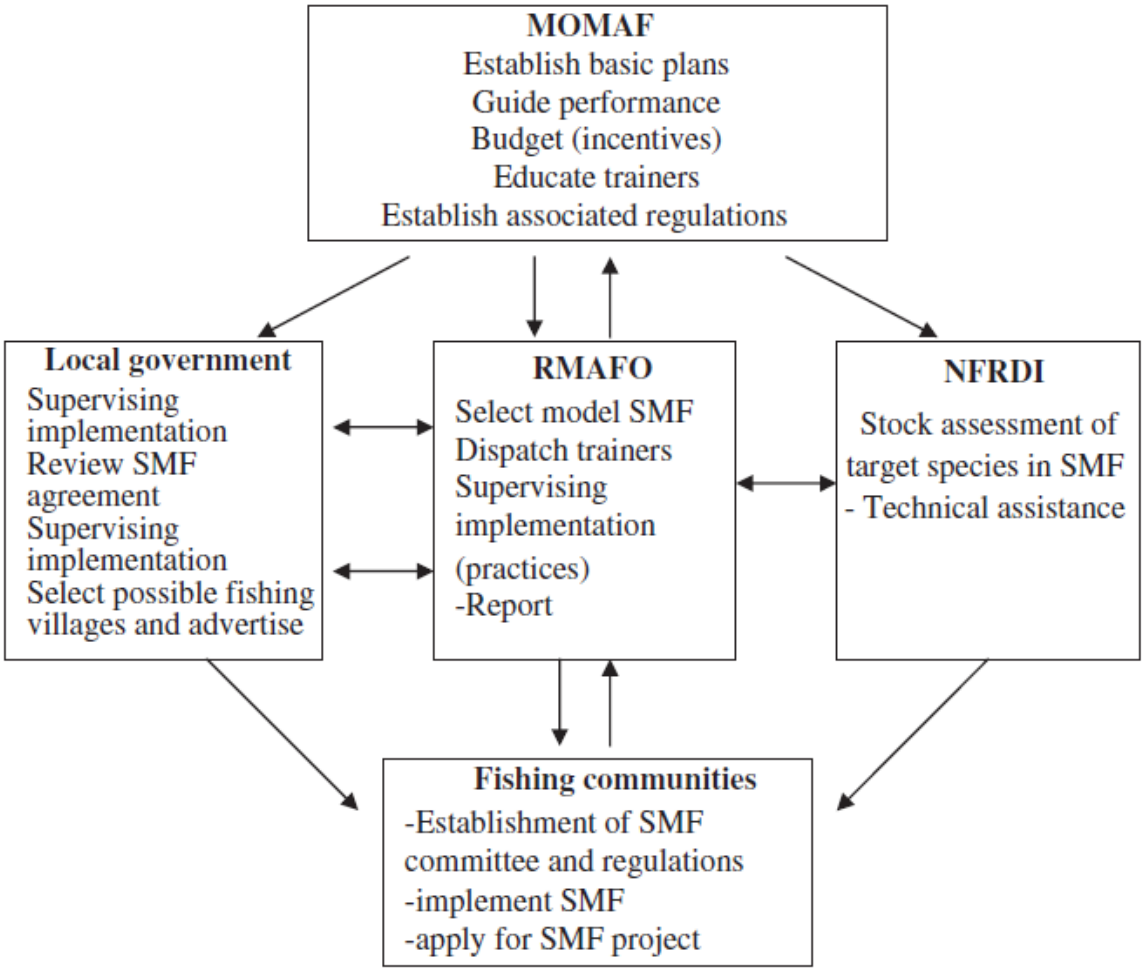

Figure 2. Flow chart of SMS. Source: Lee et al, 2006

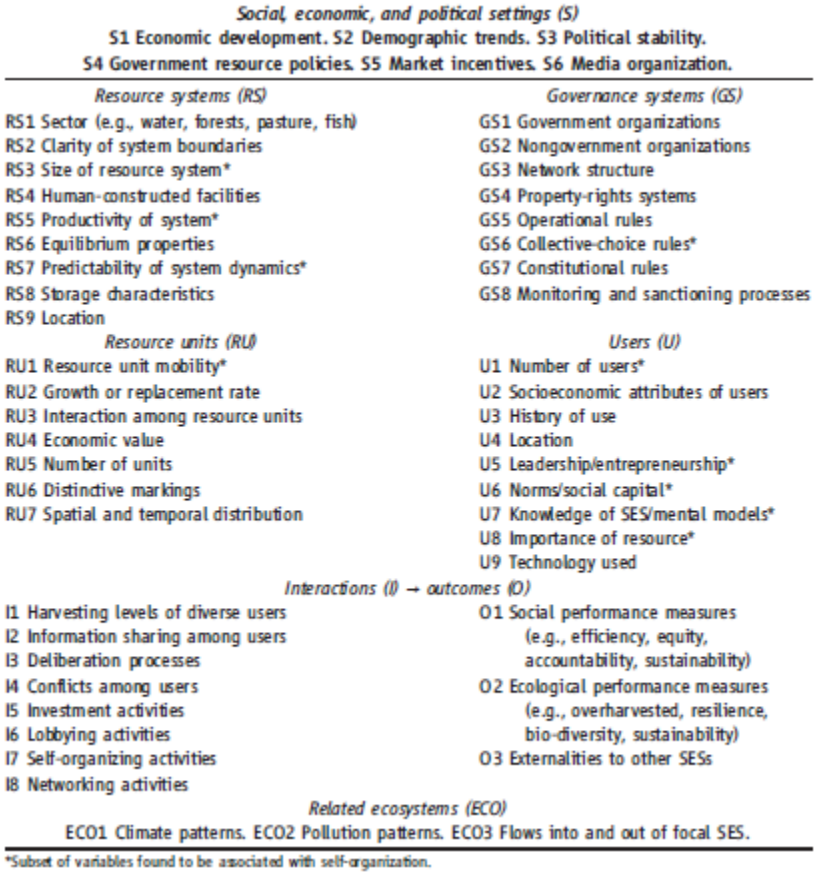

Figure 3. Ostrom's framework for analyzing social-ecological systems. Source: Ostrom, 2009

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