

**Fishers' Responses in Shellfisheries Management:
A Comparative Analysis of Cases in the United States and Japan**

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ABSTRACT

As discussions of co-management and community-based management have become popular, recent works have paid growing attention to how fishers are involved in fisheries management. Comparing the fisheries management that has been developed in the hard clam fisheries of New Jersey, U.S.A., with those of Ibaraki Prefecture, Japan, this paper examines how clammers have responded to fisheries management in the two cases. The different property-rights regimes adopted in each case can explain the characteristics of the different management systems and the differences in how clammers have been actively involved in their management systems. However, property-rights regimes cannot fully explain the emergence or nonemergence of collective actions for self-imposed rules.

Keywords: US; Japan; Clamming; Coastal fisheries management; Co-management; Community-based management

INTRODUCTION

What determines how resource users respond to schemes to manage their resources or their activities? McCay advocates, "Explaining how people relate and respond to common-pool resources requires knowing more about their 'situations' and how property rights and other institutions have been specified within those historical, ecological, and cultural situations" [15, p. 393]. These 'situations' and the institutions specified within them are factors for fishers to determine how they respond to schemes in fisheries management. These factors are interrelated; that is, they can be said to form a *web of factors*.

This paper is based on two cases: inshore hard clam fisheries in New Jersey, USA and those in the Kashimanada area in Ibaraki Prefecture, Japan. I chose these two cases because they have adopted different property rights and management systems. In New Jersey, the property-rights regime is open-access for hard clam fisheries and the fisheries have been managed at the state level through state regulations. For the Kashimanada case, the property-rights regime is communal property and hard clam fisheries have been managed through prefectural regulations, regulations of co-ops, and self-imposed rules among the clammers but the management body is at local level. Based on these two cases, I examine how property rights, as a part of the web of factors, influence how clammers (hard clam fishers) have responded to fisheries management. Comparing the two cases, the findings reveal that property rights have the greatest influence on development of fisheries management systems and how clammers are actively involved in their fisheries management systems. Looking at self-imposed rules, property rights can explain aspects of why the Kashimanada clammers have been able to develop their self-imposed rules. However, property rights cannot explain how the Kashimanada clammers have developed their collective actions to emerge self-imposed rules or why the New Jersey clammers haven't developed their self-imposed rules yet.

It is critical to understand complicated situations involved between fishers and their responses to fisheries management. The theme of this conference is “What are responsible fisheries?”. I argue that responsible fisheries are fisheries that are managed for both ecological dimensions and human dimensions for those involved in fisheries. What I hope to convey in this paper is to draw greater attention to complicated situations of the construction of human dimensions by demonstrating how various factors influence commercial fishers’ responses to fisheries management.

The paper begins with an overview of discussions developed in the common-pool resource management literature including fisheries and theories of mechanisms on how resource users respond in management regimes. Then, I will demonstrate the Japanese and US cases in a comparative analysis with special attention paid to the different property-rights regimes. Finally, I will conclude with a future research agenda regarding the emergence/nonemergence of self-imposed rules.

OVERVIEW OF COMMON-POOL RESOURCE MANAGEMENT DISCUSSIONS

There have been various debates about who should be responsible for fisheries management and what ‘successful’ management is. Since Hardin published his famous article, “The Tragedy of the Commons” in 1968 [7], debates have been waged on the roles of resource users and the extent to which user participation (co-management) as well as communal management (community-based management) can avoid “tragedy” rather than cause it. Until the 1980s, the debates were still based on the notion that fisheries are inherently ‘open access,’ and that under that condition resource users could not be expected to be responsible for resource management [8]. Starting in the 1980s, arguments that open access is not always the situation for fisheries, and that resource users can and do manage common pool resources were established, based on case studies [3, 5, 6, 16, 20]. The practices of community-based management or self-governance [1, 16, 20] and theories of co-management were also introduced [9, 10, 22, 23, 26]. Within the discussions of co-management, scholars have argued for efficient management with collaborations among government agencies, environmental organizations, and resource users; and within those of community-based management, various approaches were made under the question of what the implications are when resource users decide to govern the resources or their actions with regard to the resources [20, 21].

HOW USERS RESPOND TO THE RESOURCES?

There have been various arguments of what is co-management and community-based management; however, discussants have adopted different geographic scales and levels of organizations, and there are no uniform definitions. In this paper, the existence of co-management and community-based management is inferred from the nature of regulations and rules. Co-management refers to regulations designed with user participation; community-based management or self-governance refers to formal or informal rules determined by the resource users. This paper is based on two case studies that have elements of both co-management and community-based management. It aims to demonstrate the web of factors that have influenced

the actions that the fishers have made in managing clam fisheries, not to discuss co-management or community-based management *per se*.

How fishers have been involved in fisheries management and how they respond to the resources cannot be explained with a single aspect or two. The processes of community-based management cannot be grasped when community and state are viewed as separate and opposed entities [12, p.166] or when other internal and external factors affecting the community are overlooked [2, 15, 17]. These could be histories, geography, ecology, technology, market structures and pressures, cultural and social condition, and norms and values. Berkes advocates “*cross-scale interactions* to refer to linking institutions both *horizontally* (across space) and *vertically* (across levels of organization)” [4, p.293]. McCay discusses similar issues addressed as “horizontal and vertical linkages” [15, p.372]. As co-management and community-based management theories became popular, there have been cases of inadequately formed community-based management regimes by higher organizations such as government or NGOs [18] or inadequate decentralization of resource management [24]. Adopting co-management or community-based management without careful understanding of various factors and their linkages may harm not only the resource conditions but also local social and cultural conditions. This paper tries to understand the factors and their linkages for two cases in Japan and the US.

CASE 1: IBARAKI, JAPAN

Management System of Hard Clam Fisheries in the Kashimanada Area

Ibaraki Prefecture runs along the Pacific Ocean about three hours by train from Tokyo. The Kashimanada area (the area along the Sea of Kashima) in Ibaraki Prefecture now consists of three municipalities. The clambers targeting hard clam (*Meretrix lamarckii*, *M. hamaguri*; *chosen hamaguri* in Japanese) in the Kashimanada area belong to one of four co-ops (FCAs: Fisheries Cooperative Associations), and they are the residents of four different regions in the Kashimanada area. The regions where the co-op members live are based on the jurisdictions of their co-operatives. The coastal areas of Kashimanada have a large sandy bottom; the fishers have historically operated shellfish dredging.

The coastal resources as well as the coastal lands in the Japanese coastal regions had been exclusively exploited and managed at the village- or region-level under the feudal system since the 1700s. Even after the first modern government was established in 1868, the national fisheries law was based on the custom from the feudal system and it lasted until the contemporary fisheries law was established after World War II. Under American occupation, the feudal system was abolished and a democratized fisheries law was established in 1949. Under the contemporary fisheries law, there are three broad categories (see Table 1): Free, Fishing-right, and License fisheries. Bottom trawling fisheries are categorized into Prefectural License Fisheries; so, fishers are required to obtain a state license for bottom trawl in order to practice shellfish dredging and follow the prefectural regulations. Also, if clam resources inhabit Fishing-rights Fisheries waters, shellfish dredgers must also follow criteria of Fishing-rights Fisheries. The hard clam dredging in the Kashimanada area has been practiced within the waters of *Kyodogyogyo* fishing-rights; thus, the hard clam fishers follow the criteria of both Prefectural License Fisheries and *Kyodogyogyo* fishing-rights fisheries.

Table 1: Three Categories of Fisheries Defined by the Contemporary Fisheries Law

1. Free Fisheries --- Small scale line-fishing, long-line fishing, etc. 2. Fishing-rights Fisheries --- Set-net fisheries, aquaculture, <i>kyodogyogyo</i> (see below for the explanation) 3. License Fisheries --- Fisheries determined by either the ministry or each prefectural government
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From Kaneda [11, p. 20]

Kyodogyogyo fishing-rights fisheries are categorized into one of the three kinds of Fishing-rights Fisheries, and there are primarily three kinds of *Kyodogyogyo* fishing-rights fisheries for marine fisheries. *Kyodogyogyo* fishing-rights are given to co-ops, and co-op members may exclusively access their co-op's *Kyodogyogyo* fishing-rights zones. Co-ops apply for *Kyodogyogyo* fishing-rights zones, which are determined by their prefecture, to harvest particular species or operate particular fishing gears. Under the national Fisheries Law, co-ops are required to establish regulations to manage *Kyodogyogyo* fishing-rights fisheries and resources, which they target. The Kashimanada hard clam fisheries fall into one of the three kinds of *Kyodogyogyo* fisheries, the so-called *Dai-isshu Kyodogyogyo-ken gyogyo* (1st *Kyodogyogyo* fishing-rights fisheries). Co-op members may harvest particular species among seaweeds, shellfish, and other kinds of sedentary species within a zone determined as a 1st *Kyodogyogyo* fishing-rights zone. The Kashimanada clammers operate hard clam dredging within a 1st *Kyodogyogyo* fishing-rights zone for hard clams.

Members of other co-ops and individuals not in co-ops may not exploit the resources in *Kyodogyogyo* fishing-rights zones unless the co-op permits. This *Kyodogyogyo* fishing-rights fisheries regime can be categorized as "communal property" [6]*, access to which is limited to members of a clearly defined community based on a co-op. The national Fisheries Law requires each co-op to manage *Kyodogyogyo* fishing-rights fisheries and their targeting resources within its *Kyodogyogyo* fishing-rights zones; so, the *Kyodogyogyo* fishing-rights fisheries regime is a decentralized management system.

In the case of the Kashimanada hard clam fisheries, the clammers have harvested hard clams by shellfish dredging. Hard clam dredging is required to obtain a prefectural license of bottom trawling. Bottom trawling is categorized as a Prefectural License Fisheries (see Table 1). Under the Prefectural License Fisheries regime, license holders must follow the prefectural regulations, which are determined by a prefectural fisheries management council, and the license holders may operate their fishing activities almost anywhere within the prefectural waters. However, the hard clam population in the Kashimanada area as well as many other cases of hard clam populations in Japan inhabits the *Kyodogyogyo* fishing-rights zones. So, the Kashimanada clammers follow the regulations of their co-ops for the *Kyodogyogyo* fishing-rights fisheries for hard clamming in addition to the regulations of Ibaraki Prefecture for bottom trawling hard clams. Prefectural regulations are determined by a prefectural council, which consists of fifteen members: nine elected fishers, four academic persons who may be scientists, economists, or social scientists, and two others. Regulations of co-ops are determined by the members of each co-op, and these regulations are usually created with reference to their prefectural regulations. Additionally, the Kashimanada clammers have developed self-imposed rules to manage their hard clam fisheries activities and hard clam resources. Under this framework, based on the *Kyodogyogyo* fishing-rights regime, which is a communal property rights regime, the management body of the Kashimanada hard clam fisheries is at the local level in the Kashimanada area.

Regulations and Self-imposed Rules

Overall, the Kashimanada clammers follow the prefectural regulations, the regulations of their co-ops, and self-imposed rules. The regulations of Ibaraki Prefecture for shellfish dredging are the following. The size of a shellfish dredging boat may not exceed 5 gross tons. The maximum length of the dredge tooth bar is 2.2 m (about 87 inches). The minimum width between the dredge teeth bars is 2.5cm (about 1 inch). The minimum mesh size of the bag net is 5.5cm (about 2.2 inches). The regulations for hard clam fishery in general—created through the prefectural council—are the following: The minimum catchable size is 3cm (about 1.2inches) in the longest dimension. Hard clams cannot be taken before sunrise or after sunset. No fisher shall collect hard clams in other than the *Kyodogyogyo* fishing-rights zone(s) for shellfisheries, the so-called *Dai-issu kyodogyogyo-ken gyojo* given for clam fisheries, of one's own cooperative. No person shall use a cutter, which is similar to a rake, over 20cm (about 7.9 inches). The prefectural fisheries management council does not require seasonal closure.

The regulations of the co-ops in the Kashimanada area are created by the members of each co-op with reference to the prefectural regulations. In the Kashimanada case, the co-ops' members agreed to establish the same regulations as the prefectural regulations to manage their *Kyodogyogyo* fishing-rights fisheries and resources. In addition, the Kashimanada clammers have developed their self-imposed rules among the four co-ops and within each co-op depending on rules. These self-imposed rules are kept informal without being established formal regulations for the co-ops because these self-imposed rules are required to be adjustable depending on weather and resource conditions and rules are difficult to adjust once they are established as formal regulations for the co-ops.

There used to be more than four co-ops in the Kashimanada area and they had their individual *Kyodogyogyo* fishing-rights zones. But because the *Kyodogyogyo* fishing-rights zones of each co-op are small and profitable resources don't always inhabit their zones, historically these co-ops informally agreed to practice fishing activities over different co-ops [24, p.40]. Eventually, small co-ops were consolidated into four co-ops and these four co-ops formally combined their *Kyodogyogyo* fishing-rights zones. Each of the four co-ops is required to establish their own regulations for their *Kyodogyogyo* fishing-rights zones although they are combined. Their regulations are all the same as the prefectural regulations. Then, the clammers belonging to each of the four co-ops form clammers' associations, and these four associations have collaborated to develop self-imposed rules to manage their hard clam fishing activities and resources. Also, each association has developed individual self-imposed rules at each co-op level. The four clammers' associations have collaborated to design self-imposed rules of daily rotations, limits on days per year and hours per day that clamming can take place, the establishment of closed areas, and spawning season closure. The clammers have also been trying to reduce poaching of the hard clams by non-members of the co-ops. The hard clammers of the four co-ops in the Kashimanada area in total represent 260 boats with over 550 clammers.

In addition, each of the four clammers' associations has designed individual self-imposed rules applying to the clamming of their own members. Each of the associations has developed their own daily rotations and an income-pooling system. Also, some of the four co-ops have developed further self-imposed rules such as punishment for clammers who hide their catches without submitting the catches to the income-pooling system and a rule to limit dredging speed to avoid breakage of clams or their "legs," which reduces their value.

CASE 2: NEW JERSEY, U.S.A.

New Jersey is one of the states in the Mid-Atlantic area, U.S.A., south of New York State. The New Jersey state government through multiple agencies has mainly managed hard clam resources for the goals of public health and resource conservation through its fisheries agency in the Department of Environmental Protection and through its Health agency. Under the Public Trust Doctrine, marine resources belong to the public. Within this framework the clambers, as stakeholders, have been involved in co-management activities with the state, as members of shellfish management councils or participants in council meetings. For the New Jersey case, hard clam fisheries have been managed at state level.

The state regulations have been designed to conserve the hard clam population and to protect the public from illness that can be transferred through consuming clams collected from polluted waters, which are identified as “condemned” when they reach polluted levels of organisms such as E.coli. Shellfish cannot be taken from condemned waters. Some of the condemned areas, with low levels of pollution, are classified as “special restricted areas.” “Relay” and “deuration” clamming can take place in these areas in special programs. There are general statewide rules about clamming that are created by the state shellfish council. Shellfish cannot be taken before sunrise, after sunset or on Sundays. A license is required for the commercial harvest of hard clam. Shellfish harvested can only be sold to certified dealers. The minimum size for hard clam is 1-1/2 inches (about 3.8cm) along its longest dimension. No powered dredges can be used in the waters of the state for hard clams.

Among these state regulations, the New Jersey clambers have been actively involved in creating both relay and deuration programs for the harvest of clams from polluted waters [13]. Relay is a purification process that requires the shellfish to be transported to clean coastal waters that are certified (approved) for shellfishing and held there for a minimum of 30 days; deuration is the other purification process in which shellfish are placed in a holding container at a deuration plant and flushed with cleaned water for a minimum of 48 hours [27, 28]. The clambers live and work in highly dispersed areas along the state’s coast; they mostly collect hard clams (*Mercenaria mercenaria*; also known as *quahogs* in the U.S.). Also, the clambers have been actively involved in maintaining the state regulation of powered dredges to sustain clam fisheries.

There are two relay waters in southern New Jersey and two deuration plants in the Raritan Bay and Sandy Hook Bay areas (hereafter denoted simply as the Raritan Bay areas) in northern New Jersey. There had been only the relay program but about sometime later, some of the relay clambers left for the deuration program, which requires less time for the purifying process than the relay program. Among these deuration clambers, those who contracted with one of the two deuration plants formed the “Baymen’s Protective Association,” to organize their relationships with the deuration plant. These deuration clambers tend to operate their fishing activities in the Raritan Bay areas as well as two rivers, Navesink River and Shrewsbury River, adjacent to the southern coast of Sandy Hook Bay, while the relay clambers tend to do it in the two rivers and southern waters categorized as special restricted areas. The relay clambers usually harvest hard clams in the Raritan Bay areas as well; however, in recent years they are not allowed to harvest hard clams in the Raritan Bay because of a virus problem, which can be purified by the deuration program but not the relay program.

Seven years after the Baymen’s Protective Association was formed; the association took over ownership of the deuration plant. Now the association consists of approximately 70

clammers; they hire 30 employees for the depuration plant. In sum, the depuration and relay clammers in New Jersey follow the state regulations and the rules of the relay program or the depuration plants such as limits on the amount of clams.

CLAMMERS' ACTIVE INVOLVEMENT IN FISHERIES MANAGEMENT

I have indicated above the regulations and rules, which have been created both at the state or prefectural level and local level for hard clam fisheries in the two cases; here, I analyze the contexts of how and under what circumstances the clammers have acted in their fisheries management system. The outcomes demonstrate how the actions clammers have taken in their fisheries management relate to various factors. It is obvious though; no management action emerges when there is no problem, although a management action doesn't always emerge when there is a problem. The clammers in the two cases have acted in the fisheries management system of their own accord to deal with conflicts and issues. These conflicts and issues have been constructed under various factors: rules, laws, and regulations, as well as ecological, technological, historical, social, market, and economic conditions. Besides observing various factors, I specially pay close attention to property-rights regimes among such factors. Comparing the two cases, which employ two different property-rights regimes, communal property and open-access, I examine how the different property-rights regimes influence clammers' decisions on how they have been involved in fisheries management.

Kashimanada Case

The Kashimanada clammers have been actively involved in fisheries management for their co-ops' regulations of their *Kyodogyogyo* fishing-rights zone and self-imposed rules of their clammers' associations. As I mentioned in the earlier section, the Kashimanada clammers of the four co-ops have established management rules as their co-ops' regulations and self-imposed rules depending on whether they need to be adjustable. When co-ops in the Kashimanada area still had their individual *Kyodogyogyo* fishing-rights zones, they had informally agreed to operate *Kyodogyogyo* fishing-rights fisheries across their zones because profitable fishing grounds did not always exist in their own *Kyodogyogyo* fishing-rights zones. They legally combined their *Kyodogyogyo* fishing-rights zones in 1960s. Through their history of the combined fishing ground, they encountered an issue of overcrowding of hard clam fishing boats in limited profitable fishing grounds. Also, the hard clam population reproduces in mass quantity approximately every decade; this is an example of what biologists call the "dominant year class." And the hard clam market is small and depends on a core season. Based on these situations, they had experienced serious market price collapses caused by large simultaneous landings of hard clams. In order to manage these problems, the Kashimanada clammers of the four clammers' associations have collaborated to establish self-imposed rules of daily rotations, limit of operation days per year and hours per day, and area and seasonal closures during the spawning season. In the spirit of co-management, the four clammers' associations together collaborate with the Prefectural Fisheries Experimental Station to obtain biological information on the clam population; they refer to it to construct their self-imposed rules. Under the *Kyodogyogyo* fishing-rights regime, only members of the four co-ops may access hard clam resources in their combined *Kyodogyogyo* fishing-rights zone and hard clam resources are managed by these co-

ops; so, unlike under open-access, it is poaching if non-members catch hard clams within the *Kyodogyogyo* fishing-rights zone. Hard clams are often targeted by poachers and the clambers associations have been trying to reduce hard clam poaching by, for instance, placing members on patrol.

In addition, each of the associations has developed their own self-imposed rules. Their own daily rotations were created in order to reduce even more the numbers of boats operating the same day for the purpose of sustainable fishing activities. An income-pooling system was established in order to reduce inequality, which may be caused by varying weather and stock conditions under daily rotations. Some of the four clambers' associations establish enforcement for the income-pooling system and a rule limiting dredging speed to avoid reductions in the value of hard clams. The income-pooling system hasn't been applied to the four clambers' associations as a whole because calculations of income distribution are different in each association based on their social contexts. In addition, the enforcement and dredging speed rules are established. Those associations, which have employed these rules, have suggested to the other associations to also employ the rules, but they haven't reached consensus to do that among their members.

New Jersey Case

The New Jersey clambers have been involved in co-management activities with the state and designing the state regulations; especially, creating both relay and depuration programs to keep commercial clamming in polluted waters. The New Jersey state regulations are based on proposals, which are given by the state agencies for the purposes of resource conservation and protecting the public health. The New Jersey state agencies used to close many of the hard clam fishing grounds in order to protect the public health, but the clambers have worked with the state agencies, and developed the relay and depuration programs since the 1920s in order to continue harvesting clams from polluted waters without violation of the public health. The clambers have also been actively involved in maintaining the regulation of power dredges. This regulation was first proposed by state agencies for the purpose of resource conservation. The clambers agreed with the proposal because the regulation also protects the majority of the clambers, whose business scales are small. Over time, when some people have proposed to remove this regulation, a majority of the clambers have rejected its removal in order to keep a number of small-scale clambers in business.

There is an association of selected depuration clambers in New Jersey, the Baymen's Protective Association, and they have their rules to run their depuration plant. There are two depuration plants in New Jersey. One is owned by businessmen and the clambers who have contracts with them don't have access to the decision-making process of their operation rules; but the other is owned by the association and the association members have adopted the basic operation rules from the ones already designed before they took over the plant but redesigned the rules for distributions of the daily number of baskets. Both of the plants distribute baskets to their contracted clambers each morning, depending on how many clams the plant can process that day. The distribution rule of the plant of the association is determined by the following: full members equally get the most baskets; associate members equally get fewer; and non-members get the smallest.

The clamming in New Jersey has been constructed though the open access system under the Public Trust Doctrine. Therefore, no individual clammer or group of clambers has a property

right of fishing grounds or access to fishing like the Japanese clammers; the state is in charge of managing the resources. But as stakeholders, the clammers have been involved in the decision-making process at state level. The association was formed by selected clammers who are from different regions but shared a collective interest in accessing the depuration plant; but they haven't developed their own management rules for their clamming activities or clam resources.

Comparative Analysis

Examining the situations of the clammers' active involvement in fisheries management, the property-rights regimes can explain why the Kashimanada clammers have been involved in fisheries management at the local level and why the New Jersey clammers have done so at the state level under their legal systems of fisheries management. Under the communal property-rights regime, the *Kyodogyogyo* fishing-rights, the Kashimanada clammers are involved in establishing the local regulations of their co-ops. Under the open-access regime, the Public Trust Doctrine, the New Jersey clammers are involved in creating the state regulations. Also, the property-rights regime can explain some aspects of the reasons why the Kashimanada clammers have been able to develop and maintain such self-imposed rules, which could be ruined under an open-access regime. However, the property-rights regimes don't explain why 'collective action' [19, 20] to establish the self-imposed rules has been able to emerge in the four clammers' associations in the Kashimanada area and each clammers' association or why the New Jersey clammers haven't developed self-imposed rules to manage their fishing activities or clam resources.

CONCLUSION AND FUTURE RESEARCH AGENDA

I have been interested in how common-pool resource users, particularly marine commercial fishers, have responded to problems and acted in fisheries management systems. I am always amazed by the fact that each case has been constructed with such a tangled variety of situations. Comparing the two cases, I found that various unique factors have influenced the clammers decisions on how to act in fisheries management. These factors relate to not only laws and regulations but also to ecology, geography, technology, market, and social conditions. This paper examined how the clammers have been actively involved in fisheries management with the two cases adopting the two different property-rights regimes, communal property and open-access. The different property-rights regimes can explain the characteristics of the different management systems and the differences of how the clammers have been actively involved in their management systems. However, they cannot fully explain how collective actions emerges or doesn't emerge among the clammers in order to manage their fishing activities or resource conservation.

One of the next questions that I would like to examine for this project is the question of the emergence or nonemergence of self-imposed rules. Why could the Kashimanada clammers develop their self-imposed rules? Why haven't the clammers in New Jersey developed self-imposed rules for their fishing activities and resource conservations? McCay [15, p.366-367] addresses possible situations of the nonemergence of self-governance: the resource users recognize problems but for some reasons they cannot develop self-governance even though they want to do so; they recognize problems but they decide not to govern; and they are unaware of

the problems in front of them. I would like to add one more possible situation to these: there is no problem that requires the resource users to self-govern. For instance, the resource users might not think they need to govern their exploitation activities if the resource conditions have been good. There are various cases of self-imposed rules as the Kashimanada case under the *Kyodogyogyo* fishing-rights regime, and there are also cases under Prefectural License fisheries, in which property-rights regimes are open-access, similar to the New Jersey state licensed fisheries. There are also various cases in which the fishers don't establish self-imposed rules even though they encounter some problems in Japan. Also, there are cases of self-imposed rules by commercial fishers under the open-access regime in New Jersey [14]. My hypothesis is that there are similarities as well as differences regarding circumstances for fishers to develop their self-imposed rules even though they are involved in different management systems.

The theme of this conference is "What are responsible fisheries?". I argue that 'responsible fisheries' means fisheries that are managed in terms of ecological dimensions as well as in terms of the human dimensions of those who are involved in fisheries; both of these are very complicated and not easy to properly research or understand. However, understanding they are actually very complicated is critical in order to avoid inappropriate management regimes designed with oversimplified ideals. This paper draws one example of the intricateness seen in formations of human dimensions of commercial fishing by demonstrating how commercial fishers respond to fisheries management and what factors influence their responses.

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ENDNOTES

* Feeny et al. define four categories of property rights within which common-pool resources are held: open access, private property, communal property, and state property [6, p. 4]. Access rights to the common-pool resources as well as extraction rights of the common-pool resources are included in property rights. The definitions for the four categories are the followings. Open access is the absence of well-defined property rights. Under private property, the rights to exclude others from using the resource and to regulate the use of the resource are vested in an individual (or group of individuals such as a corporation). Under communal property, the resource is held by an identifiable community of interdependent users. Under state property or state governance, rights to the resource are vested exclusively in government which in turn makes decisions concerning access to the resource and the level and nature of exploitation. Feeny et al. also states that these four categories are ideal, analytic types and, in practice, many resources are held in overlapping, and sometimes conflicting combinations of these regimes, and there is variation within each.