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The "Crab Bank" Project: Lessons from the Voluntary Fishery Conservation Initiative in Phetchaburi Province, Thailand

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ABSTRACT

In this study, the interactive governance framework was applied to examine factors contributing to the implementation of "crab bank" projects (a voluntary conservation program) implemented in Ban Panern and Ban Klongthian fishing villages in Phetchaburi province. Using key informant interviews and participant observation, the 'step zero' or the pre-implementation stages of the projects were examined and the study assessed what characteristics of the natural and social systems associated with the fisheries, of the governing system, and of their interactions that may contribute to successful implementation of the crab bank project. The results showed that Ban Panern followed a more collaborative process in establishing the crab bank, with fishers actively involved. The high diversity of the system-to-be-governed and high level of interactions in Ban Panern contributed positively to the successful implementation, making governability high. On the other hand, Ban Klongthian struggled to maintain the project due to the low collaboration from fishers and too much reliance on the leaders. Moreover, the project was introduced by the government, and fishers were not directly involved in the early discussion. Overall, active participation of fishers in conservation projects such as the crab bank needs to be encouraged, along with improving positive interaction among fisheries stakeholders.

Keywords: interactive fisheries governance, crab bank, blue swimming crab, voluntary conservation, Phetchaburi province

INTRODUCTION

Current fisheries problems in Thailand are diverse and complex. For instance, fisheries resources are heavily exploited, with excess fishing capacity and the use of destructive fishing gear, like bottom trawls, push nets and clam dredges (Tokrisna *et al.*, 1997; Juntarashote, 1998). Fishers, especially small-scale, are not able to obtain stable and reasonable incomes from their catches due to catch reduction, price fluctuation and their lack of bargaining power with middlemen. The rising fuel prices exacerbate the situation, making it difficult for fishers to cover their costs and to obtain viable livelihoods. Those without assets or supportive networks tend to end up in debt, and many are trapped in a vicious poverty cycle. On the governance side, fishery law is outdated, monitoring and enforcement manpower are limited, and surveillance and control are not effective (Tokrisna *et al.*, 1997). These problems are complicated and difficult to solve because they are not technical but social in nature. They are what Jentoft and Chuenpagdee (2009) call

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"wicked problems", meaning that they cannot be addressed using technical solutions. Instead, first and foremost, they require an acknowledgement that the problems may be defined differently and understood differently by stakeholders. The next step is to recognize that a 'governance' approach, not management, is needed to address these 'wicked problems' of fisheries.

In Thailand, fisheries are managed using legislated regulations, implemented under the Thai Fishery Act 1947 (Department of Fisheries, 1987). Management measures that have been in place since then and are still in use today include closed areas and closed seasons, prohibition of trawl and purse seine fishing within three kilometers from the shoreline to preserve a nursing area for juvenile aquatic resources, and limiting the mesh size of trawler and purse seiners (Juntarashote, 1998; Juntarashote and Karnjanakesorn, 2001; Department of Fisheries, 2006). Some of these measures were determined after only biological consideration and are implemented using a top-down approach. Consequently, they have not been effective due to the lack of agreement and compliance of most fishers (Juntarashote, 1998). Recently, with an increasing concern on over-exploitation and heightened attention on conservation, a new set of measures, including marine protected areas, have been promoted, and a shift from top-down, state control to co-management and community-based management is taking place.

An example of these initiatives is the "crab bank" project, created by the Department of Fisheries in 2002 in response to the decline in crab fisheries catches, and as part of the national program to promote community-based fishery management. The project aims to conserve and sustain crab resources and enhance the awareness of local fishers on the importance of their involvement in fisheries management. It involves fishers releasing gravid female blue swimming crabs (*Portunus pelagicus*) in rearing cages, where the crabs are raised until they spawn. Eggs are then released to the sea to enhance crab recruitment, after which the female crabs can be sold. The key element of the project is that the gravid female crabs should be provided voluntarily by fishers, rather than the government having to buy them from fishers (Tiansongrassamee, 2008; Suanrattanachai *et al*., 2009). Since its conception, the crab bank project has been implemented in many coastal provinces, and according to an assessment in 2004, catch rates have increased (Petchkamnerd *et al*., 2004). This is, by no means, sufficient to conclude that the crab bank is an effective management and conservation method and that it can be successfully implemented in all coastal areas. Following Chuenpagdee and Jentoft (2007), the current study submits that a study of the 'step zero' or the pre-implementation stage of a crab bank project is essential in determining its success. Further, a 'governability' study (Kooiman, 2008) that examines what factors contribute to successful implementation of a crab bank project and what factors inhibit its progress is needed to help achieve the overall conservation goal. Learning from these studies would help determine whether the crab bank project should be promoted in all coastal areas, and if so, how it should proceed.

This paper is an illustration of these propositions based on the comparative analysis of two crab bank projects in Phetchaburi province. It describes the interactive fisheries governance and the governability concept, which is the analytical framework of this study. Next, it presents the study area and the methods, followed by the results of the step zero and the governability assessment. It concludes with discussion about the broader application of the crab bank project to address fisheries problems in Thailand.

THEORICAL BACKGROUND

Governance is not a new concept. Because

the term has been traditionally used to mean to pilot or to steer, it is normally associated with what governments do (Kjær, 2004). Today's usage of the term governance is more comprehensive, with the recognition that other actors besides government play governing roles, which are broader than routine management activities. Drawing from interactive governance theory (Kooiman *et al*., 2005), the current study employed a system approach in examining the characteristics of the system-to-be-governed, the governing system and the interactions between them. The system-to-be-governed is further divided into the natural and the social systems. The governing system is defined as the formal and informal institutions playing a role in governing. They are responsible for influencing the behaviors of the social system through interventions such as regulatory measures and institution building that induce resource users and other actors to cooperate. Finally, governing interactions are ways in which the governing system is made aware of and sensitive to the diversity, complexity, dynamics and scale issues within the systems-to-be-governed. They are related, for instance, to how information is collected and communicated, how representation is organized, and how stakeholders participate in governance (Chuenpagdee and Jentoft, 2009).

A key concept in the interactive governance theory is 'governability' (Kooiman *et al*., 2005). A governability assessment helps governors understand how far they are from reaching the goals. It recognizes the intrinsic and constructed qualities of the fisheries system or its performance that contributes to the actual governance (Chuenpagdee, 2011). In assessing governability, four attributes of the systems—diversity, complexity, dynamics and scale—were examined (Figure 1). *Diversity* is related to the heterogeneity of system, which can be examined by looking at its components, that is, what it is made of, in what numbers, and how they are different from each other. For *complexity*, the study looked at relationships between components; for instance, their inter-dependency or how one positively or negatively affects the other. Next, *dynamics* refers to the fact that the three systems are volatile and can change over time. Some of these changes are linear, but frequently they are unpredictable and unexpected, as when natural disasters, like a tsunami or hurricane, hit coastal areas. System dynamics are expressed as interactions, that is, how the related components influence each other and how change in one part impacts other elements and the whole system. Finally, *scale* relates to the spatial and temporal dimensions and the focus on boundaries helps explain how they define components and confine relationships and interactions (Jentoft and Chuenpagdee, 2009).

MATERIALS AND METHODS

Study area

Phetchaburi province is located in western Thailand at the northern end of the Malay Peninsula. With four of the eight districts located along the coast, fisheries are economically important to the province. In 2010, fisheries provided over 25,000 t of products or approximately THB 1.5 billion (USD 50 million) in value (Office of Phetchaburi

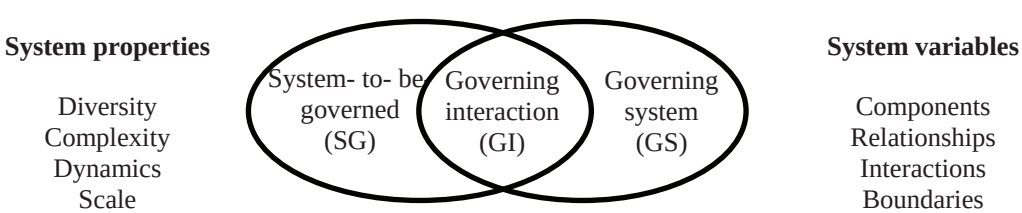

Figure 1 Governability assessment framework (Source: Jentoft and Chuenpagdee, 2009)

Province, 2010). The two fishing villages with blue swimming crab bank projects where the study was conducted are Ban Panern and Ban Klongthian (Figure 2). Ban Panern, in Laem Phak Bia sub-district, is a small village of about 1.4 km^2 (885 rai) with 177 households (Laem Phak Bia Tambon Administration Organization, 2010). Marine fishing is a major occupation, with blue swimming crab as the main target species. Crab gill nets and collapsible crab traps are the two main types of gear used. The second village, Ban Klongthian, is located in Cha-am Municipality about 35 km south of Ban Panern. It is larger in area (about 3 km^2 or 1,875 rai) with 247 households (Cha-am Municipal Office, 2011). Similar to Ban Panern, blue swimming crab fisheries are important.

Data collection

The study was conducted using a mixed method of literature review, key informant interviews and participant observation. The literature review included journal articles, technical papers, government reports, existing statistics and students' theses. A series of open-ended questions was used in the key informant interviews. They consisted of questions related to the pre-implementation stage of the crab bank project in the study area and the natural system and the socioeconomic system. Additionally, the study asked about the interactions between the system-to-be-governed and the governing system in each village. The interviews took place during August–September 2011, along with participant observation to investigate the characteristics of the communities in the two villages. Key informants for this study were chosen using a combination of snowball and purposive sampling methods. The latter was to ensure that the interviews covered a range of stakeholders who were knowledgeable about all aspects of the systems. In total, 31 people were interviewed in both villages (Table 1).

RESULTS

Step zero of the crab bank projects

The crab bank project in Ban Panern was initiated by the Thai Sea Watch Associate, a non-governmental organization (NGO) based in southern Thailand. Through informal discussion with local fishers about their activities and livelihoods, and recognizing the problem with blue swimming crab production, the crab bank concept was proposed by the NGO in 2007. The proposal was met with some interests by the local fishers. As a leader of one fishing group stated, "*… fishers will agree with the NGO staffs when they advise them*

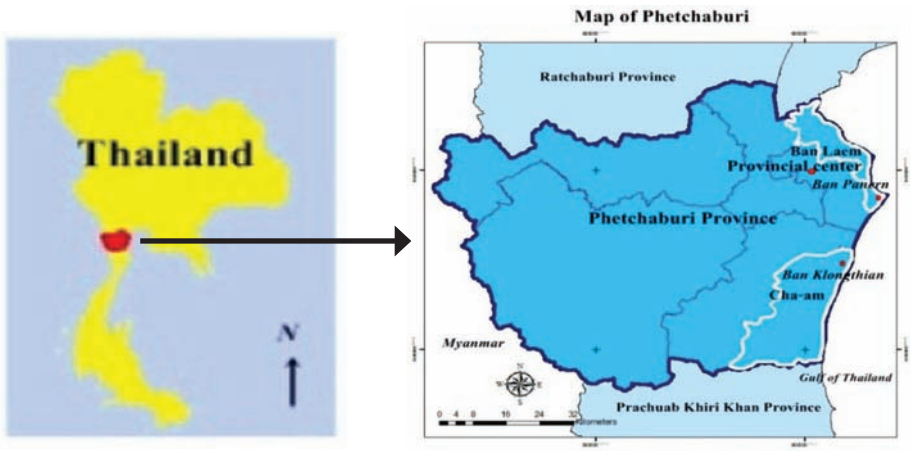

Figure 2 Study areas: Ban Panern and Ban Klongthian in Phetchaburi province.

on matters advantageous to the village, but will go against if those staffs ask to do in the negative way such as protesting to the government". The NGO organized a visit for a small group of fishers from the village to observe an ongoing crab bank project in Nakhon Si Thammarat province. Upon their return, fishers started the crab bank project in 2009, with the help of the NGO and with support from various units of governments. The crab bank project is managed by a committee comprising 15 villagers.

At first, the crab bank floating cages were anchored in the sea about 2 km from shore. Later the operation was moved to an inland area along the riverside, to avoid transportation and weather problems. The process began with the collection from fishers of gravid female crabs with eggs at the greenish-black stage. These crabs were placed into plastic buckets that contained salt water, with one crab in each bucket. When the eggs hatched to the zoea stage (about 1–2 d), the crab larvae were released to the sea through a tube attached to the bottom of the bucket. After the female crabs had released their eggs, they could be sold, and income from the sale was used for maintenance of the hatchery and other facilities. The crab bank project in Ban Panern is still in operation today, with good collaboration from fishers including the months when gravid female crabs are scarce such as in June and July.

In Ban Klongthian, the crab bank project was suggested by a few government fishery biologists, who conducted research on the hatching rate of blue swimming crabs in the area in 2007 (Jindalikit *et al*., 2010). The project was introduced as a way to help the recovery of crab fisheries resources. After agreement was reached at a village meeting, a similar process was followed to that in Ban Panern, but without the visit to a successful site. Funding was provided by the government and the fishery biologists continued to play a key role in the project. Like Ban Panern, the crab bank committee consisted of 15 people. Although the crab bank project still exists, there has not been any activity for some time because of the scarcity of gravid female crabs and due to the health problems of the crab bank project leader.

Characteristics of the two studied villages

Natural system-to-be-governed

Diversity: The coastal areas in Ban Panern village consist largely of mud flats and sandy beaches, with some mangrove forests (Pollution Control Department, 2004). Numerous

Table 1 List of key informants interviewed in this study.

Category	Number of key informants	
	Ban Panern	Ban Klongthian
System-to-be-governed		
Fishers	4	4
Villagers who are not fishers	2	2
Housewives of fishers	2	2
Fish traders	1	1
Governing system		
TAO/municipality officers	1	1
Village leader	1	1
Fisheries group leaders	3	1
Department of Fisheries	2	2
Non-governmental organization	1	-
Total	17	14

aquatic species are found in the area, such as threadfin (*Eleutheronema tetradactylum*), longtail sard (*Tenualosa macrura*), sand whiting (*Sillago sihama*), mackerel (*Rastrelliger spp.*), large-scale tongue sole (*Cynoglossus macrolepidotus*), hard shell (*Meretrix meretrix)*, blood cockle (*Anadara granosa*), razor clam (*Pharella javanica*), banana shrimp (*Penaeus merguiensis*), blue swimming crab (*Portunus pelagicus*), mud crab (*Scylla serrata*), and squid (*Loligo spp.*) according to the Office of the Royal Development Project Board (1997). In addition, dolphins and Bryde's whale can be found in the area. With this level of biodiversity, the natural system-to-be-governed is considered to be 'highly' diverse.

Ban Klongthian has long stretches of white sandy beach and good water quality for recreation (Pollution Control Department, 2004). There are fewer mangrove forest areas in the area. Aquatic species in the area are similar to those found in Ban Panern, but with the addition of spotted Babylon (*Babylonia areolata*) and Dollfus' octopus (*Octopus dolifusi*). While dolphins can still be found, one of the fishers interviewed mentioned that they have not seen Bryde's whale in the area for a long time. Compared with Ban Panern, the natural system-to-be-governed is considered to have a 'moderate' level of diversity.

Complexity: Mud flats and mangrove forests in Ban Panern serve as important habitats for juvenile fish and crabs and especially dwelling animals like clams (Aksornkoae, 2007). This dependency makes for complex relationships in the natural system-to-be-governed. In addition to the natural habitats, artificial reefs have been installed in the Ban Panern area to help increase fisheries productivity (Supongpan and Jenkitkosol, 2003). There is also a waste water treatment system, which enhances the abundance of coastal fisheries resources, especially those in the benthic zone such as blood cockle and hard shell. Therefore, the natural system in Ban Panern is highly complex. With less mangrove forests, Ban Klongthian is relatively less productive and less complex than Ban Panern.

Dynamics: Coastal areas are influenced by tidal waves; thus the organisms have to constantly adjust their behavior to adjust to such changes. In both villages, some aquatic species have certain migration patterns that suggest a moderate level of dynamics. For example, blue swimming crabs move into shallow areas for spawning. Their larvae live in the estuaries for a period before migrating to the open sea (Jindalikit, 2001). Other elements of the natural system demonstrate less dynamics. Mangrove forests, for instance, are slow to grow back after being clear-cut 20 years ago during the aquaculture boom (Sawunthong, 2008). On the whole, the dynamics of the natural system in Ban Panern and Ban Klongthian are moderate.

Scale: Although both villages are small in size, the boundaries are not as clear because of the openness of the coastal area and the connectivity to the watershed. In both cases, there are canals that link freshwater sources to the sea. These characteristics create a moderate level of scale issues that may contribute to governability challenges in both villages.

Socio-economic system-to-be-governed

Diversity: From the interviews and field observation, the study found that small-scale fishers in Ban Panern use multiple types of gear, targeting multispecies. The main types of gear were crab gill nets, fish gill nets, shrimp gill nets and collapsible crab traps. Large-scale fisheries also exist, to a lesser extent, using mackerel purse seine and squid nets. Most of these fisheries hire foreign labor. Some women gather hard clam and blood cockle using small hand dredges and some go fishing with their husbands, in the case of small-scale businesses. The majority of small-scale fishers are members of three fisheries groups—the crab bank project, the community fish marketing organization and the community boat

repair service. There is also a women's enterprise, which produces ceremonial flowers for funerals. Other non-fishing occupations dominating the area are day laborers and merchants or small traders. The multitude of livelihoods and types of employment contribute to the high diversity in the social system-to-be-governed in Ban Panern.

Livelihood activities were similar in Ban Klongthian, with more fishers using collapsible crab traps; some fishers use octopus traps (not found in Ban Panern), and more foreign labor. Women in Ban Klongthian are more actively involved in selling the fish products directly to consumers than those in Ban Panern, given their location. The social diversity in Ban Klongthian is considered to be similarly high.

Complexity: Although not all fishers in Ban Panern are involved in the activities of the fisheries groups in their community, groups were created based on the agreement of most fishers. Some conflicts occasionally occurred but fishers mostly collaborated when dealing with those from outsides who fished illegally in their fishing area. This high collaboration results in a medium level of complexity. While there are fewer fisheries groups, the relationships among the village members in Ban Klongthian are more complicated, due for instance to more foreign labor and more women involved in the fish trade. For this reason, the social complexity of Ban Klongthian is considered to be higher than that of Ban Panern.

Dynamics: The richness of the resources causes short-term dynamics in the fisheries sector in both villages, with fishers making daily decisions about what species to target and thus what gear to use. For instance, according to the interviewed fishers, they use shrimp gill nets in the southwest monsoon season, from mid-May to September, but switch to crab gill nets in the northeast monsoon from November to mid-March. In addition, the dynamics of the system can be seen from how fishers communicate among themselves about their fishing activities, which may influence their daily decisions, as well as how they interact with fish traders to find out the best price offers. In the case of Ban Klongthian, fishers also interact with tourists, who buy seafood directly from them. In both villages, the dynamics are high.

Scale: Houses in Ban Panern are clustered near each other because of close kinship among villagers. There is clear delineation for areas used for different activities, such as the salt pan and shrimp ponds, as was also found by Sawunthong (2008). Small-scale fishing activities take place within 10 km of the shore. The few local fish traders sell their goods directly to fish markets in Bangkok and Samut Sakon. These characteristics contribute to medium level of scale issues. Ban Klongthian, on the other hand, has some houses concentrated around the landing area while others are spread out, covering a large area. Communication between villagers is more difficult in this village compared to Ban Pranern. Rather than relying on fish traders, fishers in Ban Klongthian sell directly to tourists or bring their catches to sell at the market in Cha-am municipality. The scale issue in Ban Klongthain is thus considered to be high.

Governing system

Diversity: The village head of Ban Panern is the formal governing actor at the lowest level of government. The next level up in the governing system is the tambon (subdistrict) administration organization (TAO), created from the decentralized strategies of Thai governments since 1994 to administer the whole subdistrict (Arunakasikorn, 1995). The main government agency directly responsible for fisheries management is the Department of Fisheries, which is supported by the Phetchaburi Coastal Fisheries Research and Development Center, as well as district and provincial fisheries offices. Other organizations playing key roles in coastal resource management are the Department of Marine and Coastal Resources, the Royal Laem Phak Bia Environmental Research and

Development Project, Phetchaburi Rajabhat University, the NGO and fisheries groups. The wide range of governing actors makes the governing system highly diverse.

Cha-am is considered a 'medium scale' city (more than 10,000 people) and is thus governed by the Office of the Cha-am Municipality, which functions similarly to the TAO in Ban Panern. At the village level, a community chairman is responsible for governing. The diversity of the governing system is therefore medium.

Complexity: The two levels of formal governing actors, that is, the village leader and the TAO, create a complex relationship in governance and each actor has a different influence on how the fisheries are managed. Other government groups have overlapping responsibilities in coastal resource management. For instance, monitoring, control and surveillance duties are performed by three other units in addition to the Department of Fisheries the Phetchaburi Marine Fisheries Suppression and Prevention Center, the Department of Marine and Coastal Resources, and the Patrol Unit of the Marine and Coastal Conservation Center. The multiple agencies and the general lack of collaboration between these organizations generate a high level of complexity in Ban Panern. Complexity in Ban Klongthian is comparatively low.

Dynamics: Most of the government organizations and the NGO have regular, although not frequent, interaction with village leaders, including the leaders of the fisheries groups. They consult with each other about the fisheries and the crab bank project. At the village level, the leader or the municipality chairman is normally an important and respectable figure, who is appointed by election. According to the Local Administration Law 1914 (B.E. 2457), the appointee can be in the leadership position until reaching the 60 years of age (Arunakasikorn, 2000). Thus, growth and development in the village depends heavily on the leadership quality and ability of these village leaders. The dynamic is considered to be at the medium level in both villages.

Scale: Lam Phak Bia TAO is responsible for four villages, while the Office of Cha-am municipality has 15 communities under its care. The Department of Fisheries covers 22 coastal provinces in the country but has units at the regional and provincial levels for local management and data collection. It also collaborates with international organizations like the Food and Agriculture Organization of the United Nations (FAO) to combat illegal, unreported and unregulated (IUU) fishing. Thailand has adopted the plan of action proposed by the FAO, and thus has to certify that marine fisheries and fishing products exported to the European Union are not from IUU fishing. The wide ranging scope of their responsibility makes the scale issues high for the governing system in both villages.

Governing interactions

Based on the interviews with the key informants, the study found that representation and participation of stakeholders were higher in Ban Panern than in Ban Klongthian. In Ban Panern, many fishers are involved in the crab bank project, and in leading other fisheries groups. To represent other fishers in any project is not an easy task, as noted by the fishers involved in the crab bank project in Ban Panern, "… *no reward returns to me except the pride that we are the one helping crab resources to recover, it is not a waste the time but we need to make the time for it. If I do not initiate it, the project could not be implemented"*. These actions suggest that fishers have meaningful participation in the project. There are a few methods of communication in the village such as radio broadcasts and face-to-face discussion. The different levels of government communicate with the village leaders through formal meetings and conversations. Moreover, the fisheries extension officers have monthly meetings with fishers and villagers. In both villages, the level of communication and information sharing

is considered to be high. With respect to learning and adaptation, the study found that there were more of these interactions in Ban Panern than in Ban Klongthian. For instance, the villagers in Ban Panern have learned about waste separation and waste water treatment from the extension unit of the King's Royal Project and have adapted these methods in their households. The villagers seem to have a high level of awareness about the importance of maintaining a good environment in their area. Such learning and adaptation is not seen in Ban Klongthian. Finally, Ban Panern seems to have greater appreciation and collaboration than in Ban Klongthian. The crab bank project in the latter has temporarily stalled due to the lack of donations of gravid female crab by the fishers. According to the project leader, "*… high price of crab due to the tourist attraction may induce fishers to want to sell their crabs, more than donate them to the project.*"

DISCUSSION

Table 2 summarizes the key characteristics distinguishing the two fishing villages and their crab bank projects. These characteristics determine the level of 'governability' and the likelihood of success of each project. The study showed that the overall characteristics of the two villages are not very different because they are located in the same province, only a short distance from each other, and they having similar governing systems. Yet, there are some notable exceptions which contribute to different levels of governability. First, Ban Klongthian has less mangrove forests and smaller mud flat areas, and is considered to be less diverse and complex. The importance of these ecosystems in mitigating damage and protecting coastal areas, livelihoods and assets makes governance challenging. Such difficulty is further compounded when the dynamics and the spatial extent of the coastal ecosystems are considered. Aquatic animals in these areas, especially the blue swimming crab, undergo movement or migration patterns throughout their life cycle. Wave and tidal currents or a huge freshwater flooding into the sea occur often and can kill off some aquatic animals that are sensitive to salinity fluctuations. On the other hand, some changes are manageable with the reforestation of mangrove forests and the installation of artificial reefs, both of which contribute to increasing the fisheries productivity in the coastal areas. Taken together, it may be stated that the characteristics of the natural system-

Table 2 Comparative analysis of the two villages and their crab bank projects.

Characteristic	Ban Panern			Ban Klongthian		
	NSG	SSG	GS	NSG	SSG	GS
Diversity	H*	H	H*	M*	H	M*
Complexity	H*	M*	H*	M*	H*	M*
Dynamics	M	H	M	M	H	M
Scale	M	M*	H	M	H*	H
	Governing interactions			Governing interactions		
Representation/participation	H*			M*		
Information/communication	H			H		
Learning/adaptation	H*			M*		
Appreciate/collaboration	M*			L*		

NSG = Natural system-to-be-governed; SSG = Social system-to-be-governed; GS = governing system; H = high; M = medium; and L = low.

***** = Difference between two villages.

to-be-governed in both villages will likely cause some difficulty for governance, resulting in a moderate level of governability.

With respect to the social system-to-be-governed, both villages have a high level of diversity, with fishers, other resource-dependent users and those not directly related to coastal resources. These stakeholders also have complex relationships, with close kinship in the case of Ban Panern and with people external to the community (like tourists in the case of Ban Klongthian. These characteristics contribute to the difficulty of governance; thus, there is a low level of governability in both villages. Fortunately, the dynamics and scale of the social systems in Ban Panern do not present major challenges to governance. Thus, when considering all elements together, the governability level of the social system-to-be-governed in Ban Panern is considered to be moderate. In the case of Ban Klongthian, with more foreign workers and more scale issues, due to the exchange with tourists, governance challenges are higher and thus lower the governability of the social system in this village.

Even when the properties of the natural and the social systems-to-be-governed do not represent major governance challenges, if the governing system is not suitable for or capable of performing its duties, governance outcomes may not be successful (Jentoft and Chuenpagdee, 2009). With fishers in Ban Panern playing active roles in addressing any resource crisis, including participating in the crab bank project, they do not rely solely on the village leader. The decentralization that has taken place in Ban Panern is an alternative option that helps lighten the village leader's work load. Further, having more actors involved in governance can be positive when they are organized and collaborating well. The close relationship between the NGO and the community, and the good collaboration of fishers, contributes to making the crab bank project in Ban Panern more governable than in Ban Klongthian. The governability of the crab bank project in Ban Panern is also high because fishers and the leaders use their experiences and local knowledge to help make decisions, which, according to Wilson *et al*. (2006), is one of the key factors for successful resource co-management.

The last element in assessing governability is the interaction between the systems-to-be-governed and governing systems. High governing interaction among both systems could contribute to a high level of governability (Chuenpagdee and Jentoft, 2009). The governing interaction of both villages in terms of learning and adapting is medium, but information and communication is high. The ways to communicate, through news broadcasting towers and monthly meetings in both villages, are neither diverse nor frequent. Yet, they are appropriate for the small village setting, with a clustered house pattern. There are differences in representation and participation, and appreciation and collaboration between both villages, with a higher level of interactions in Ban Panern than in Ban Klongthian. This level of interactions depends on the willingness of the villagers and the fishers, especially with respect to the crab bank project, which is a voluntary measure. One way to increase interactions is by having a project leader indicating the goals of the project and the advantages that participants will be receive. As Vesarach (1985) stated, a good leader is a major factor in pushing forward the participation of population in the communities besides the physical and economic characteristics, and the incentives. However, this process is challenging for the governing system in Ban Klongthian, which implies that it has a lower level of governability.

Finally, as suggested by Chuenpagdee and Jentoft (2007), the success of the crab bank project depends partly on its step zero. The different forms taken in the step zero stage of the crab bank projects in the two villages are likely the reason why the projects are at different stages.

The involvement of the NGO and the field visit to another crab bank project by Ban Panern fishers are the main factors contributing to successful creation and implementation of the crab bank project in this village. Fishers and other community members have also been in agreement about the rules and the norm for operating in the village, such as no fishing on Buddhist holy days, which also contributes to the recovery of the fisheries resources. On the other hand, the lack of a role model, inspiration and leadership in the case of Ban Klongthian has resulted in slow progress and eventually the temporary halt of the program.

CONCLUSION

The overall governability assessment of the fisheries system and the crab bank project in both villages showed that the key factors contributing to a high level of governability were the high diversity in the natural system, which enables fishers to diversify their livelihoods, the medium complexity in the social system with less problematic relationships, and the relatively low dynamics and the smaller scale in both the natural and social system-to-be-governed. For the governing system, factors fostering governance were the high dynamics and high level of coordination and collaboration within the community supported by governing actors that play critical roles at different stages in the implementation of the crab bank project. In terms of interactions among systems, the high level of participation and representation, and the high level of appreciation and collaboration are key factors contributing to the high level of governability. With regard to factors inhibiting the implementation and success of the crab bank project, the study found that the village location is an interesting feature. In addition, high diversity and high complexity in the systems-to-be-governed may be inhibiting factors.

Generally speaking, high governability implies less demand from the governing system, but any fishery will likely have a mixture of high and low governability in the systems (Song, 2009). The current study showed that although there is high diversity and high complexity in the system-to-be-governed, high levels of interactions, through learning, adaptation, and participation, contribute to making the system more governable. Thus, for Ban Klongthian, ways to improve the crab bank project implementation may be to encourage cooperation and make explicit what the benefits of the project are. For example, giving small rewards, like a team t-shirt, to project members may help promote participation in the crab bank project. Recruitment of new members and a new generations of leaders to the committee is likely to help revitalize the project. More fisheries groups and associations should also be established to induce fishers' participation, representation and collaboration.

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