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Does Fisheries Co-management Work in Malaysia?

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ABSTRACT

The top-down centralized management has failed to provide equitable access to fishing and unfair distribution of benefits towards the poor fishing community in Asia. Community-based management and co-management of fisheries have been implemented in several countries in Asia over the decades. Management models have been developed based on the partnership between governmental organizations (GO), NGOs and fishing communities. This paper discusses the different approaches of the community-based models and how the local community-based institutions have participated for better management of fisheries resources. The paper also discusses the role of partner organizations and fishing communities for effective community-based management of fisheries in Asia. The paper discusses the policy issues of regulatory framework and governance of fisheries in Malaysia. The paper concludes that inequitable access to fisheries, restricted fishing activities are the major policy issues that need to be considered for successful community-based management in Malaysia.

1. Introduction

The large over-exploitation of marine fisheries in many countries has drawn the attention of policymakers over the last decades. Fisheries managers and governments have been struggling with how to manage fisheries where one-third of fish stocks are overexploited worldwide yet more than one billion people depend on seafood as their primary source of protein (FAO 2009 and Worm et al 2009). In the Asian developing countries alone, almost 65 percent of the world's fishers are categorized as the poorest of the poor, continue to depend on fish for food and livelihood survival. Fish productivity has been reduced due to increased fishing pressure in the Southeast Asian region. Over the past 40 years, standing fish stocks in South-East Asia have been reduced to less than a fourth of their former levels (Pauly *et al.* 2002, Pauly *et al.* 2005). The current fisheries crises pose threat to sustainable fisheries and livelihoods. Various regulatory tools have experimented which encompasses a wide range of conservation-based management measures to protect the resource and improve economic efficiency (Scott 1979; Beddington & Rettig 1984). In many countries, the government has enacted new laws and expanded to increase their monitoring, control and surveillance capacity. However, most of the efforts have failed to achieve effective governance and sustainable exploitation of resources. In tropical, small-scale, multi-species fisheries, the concept of state management was faced with enormous implementation and enforcement difficulties where resource access and income distribution are major obstacles to sustainable development. The failure of centralized authorities in managing such resources has been recognized and delegation of management of small-scale fisheries to the local resource users is now seen to be the only rational

way of obtaining effective governance. Metzner (2008) highlighted that there are many examples of limited access fisheries where the stocks have been overfished, over capacitated, and unprofitable. Limiting participation in fisheries and catch is not the solution; there is a need to have a sharing mechanism that determines the equitable distribution of benefits. The government of Malaysia has been working to attain sustainable use of fisheries and to improve the socio-economic conditions of small-scale fishing communities. There is a growing recognition that AR and MPA play potentially effective management tools in sustaining coastal fisheries in several countries. Various regulatory measures have been implemented in fisheries, however, the government has failed to reduce excess fishing capacity in coastal marine waters. The centralized fisheries management system provides limited scope for sustainable and equitable fisheries management in Malaysia.
Community-based co-management has been implemented in inland riverine fisheries in Sabah, east of Malaysia. Another co-management pilot experimental project has been implemented in Kedah state of Peninsular Malaysia. In Malaysia, the government has implemented AR and MPA programs in several coastal areas for more than thirty years. Yahaya (1994) highlighted the experiences of various participatory institutional arrangements in artificial reefs and fish aggregating devices in Malaysia. The characteristics of community-based institutions are different due to heterogeneous fishing communities and local circumstances. However, the co-management programs are at different stages of progress and they are still progressing. This paper summarizes the experiences of participatory co-management approaches in Malaysia. The objective of the study was to describe the existing community based participatory management approach being implemented in various locations in Malaysia, to assess the potential evolution of fisheries co-management based on the existing community-based programs in artificial reef locations in marine fisheries, and, to recommend the community-based model in marine resources in Malaysia.

2. Malaysian marine capture fisheries

With a coastline of around 4,810 km and an *Exclusive Economic Zone* (EEZ) of 418,000 km^2 the economic potential of the marine fisheries is enormous in Malaysia. The sector is an important source of employment and income for more than 150 thousand people (Department of Fisheries, DOF, 2010). Fish is a source of animal protein with a per capita consumption of about 45.1 kg in 2009 (Ministry of Agriculture and Agro-Based Industry, MOA 2010). The value-added of the primary fishery sector represents 11% of agricultural GDP and 1.3% of national GDP with a positive balance of trade of RM 601 mil. Marine capture fisheries account for about 75 percent of total fish production in Malaysia (Department of Fisheries, DOF, 2009). Studies found that fishing vessels operated in all fishing zones have reached close to the full technical efficiency and capacity utilization. Abu Talib et al. (2003) found that the demersal species are already overexploited and the level of fishing effort is beyond that needed for maximum sustainable yield. The continuous depletion of resource stocks is threatening the fisheries in Malaysia. The fisheries industry in Malaysia can be divided into marine fisheries, aquaculture, public water bodies and inland fisheries. Geographically separated by the South China Sea, Malaysia is divided into two regions: Peninsular Malaysia – which lies south of Thailand, and East Malaysia – which lies north of Indonesia on the island of Borneo. The fishing fleets of Malaysia can be generally categorized into commercial fleets and traditional fleets. The commercial fleets consisting mainly of vessels operating trawls and purse seine gears, while traditional fleets operate traditional gears such as drift/gill nets, hook and lines, traps, bag nets etc. The commercial fleets can be further classified by tonnage classes. Various tonnage classes specified in the Annual Fisheries Statistics are: (1) less than 25 gross tonnage, (2) between 25 and 39.9 gross tonnage, (3) between 40 to 70 gross tonnage, and (4) greater than 70 gross tonnage. In Malaysia, the marine fisheries resources have declined considerably over the past decade primarily due to overfishing particularly by using trawls. Commercial fishing gears, i.e. trawl

nets and fish purse seines are prohibited from fishing in Zone A (0-5 nautical miles) to reduce fishing effort.

2.1 Fisheries Regulatory Framework

Malaysia employs a zoning system in fisheries where water areas are divided into fishing zones based on the distance from the coastline. In peninsular Malaysia, Zone A is less than 5 nautical miles from shore, Zone B is 5 to 12 nautical miles, Zone C is 12 to 30 nautical miles and Zone C2 is more than 30 miles. Under this system use of commercial gears, i.e. trawl nets and fish purse seines are prohibited in Zone A, this area is reserved for the artisanal fishers using traditional fishing gears. Licensing of fishers, vessels and fishing gear were introduced with strict terms and conditions for reducing fishing effort. In addition to the zoning arrangement and license limitation, mesh size regulations for the cod end of trawl nets were extended from 1 inch to 1.5 inches and beam trawlers were prohibited. In order to limit overexploitation, a policy for conservation with a moratorium has been implemented. However, the issue of additional licenses for trawlers within 12 miles was frozen.

The main reason for the overexploitation of fisheries resources is due to its open access characteristics in Malaysia. However, overfishing is not only occurring due to open access of the resources, but also through the encroachment of trawling in the traditional fishing grounds. The main purpose of establishing artificial reefs is to protect marine habitats from trawls and to compensate for the effects of stock depletion. The DOF has developed strong and heavy ARs for this purpose. The DOF does not allow fishing surrounding AR areas to enhance fisheries' resources. Fishing rights are determined by the license provided by the DOF. The Fisheries Development Authority's mandate is to upgrade the socio-economic status of the fishermen community, and as such has policies to:

- promote and develop efficient and effective management of fishery resources and fish marketing;
- create and provide credit facilities for fish production;
- engage in fishery enterprise through boat construction, and the production and supply of fishing gears and equipment;
- promote, facilitate and undertake economic and social development of the Fishermen's Associations;
- register, control and supervise Fishermen's Associations and Fisheries Cooperatives; and
- co-ordinate the implementation of various fisheries activities.

3. Development of Artificial reefs and Fish Aggregating Devices in Malaysia

There is a growing recognition that artificial reefs play a potentially effective role in sustaining coastal fisheries in several countries. It is also acknowledged that although artificial reefs can be a tool for "fisheries development," their functioning as a tool for "fisheries management" is difficult (Meier et al., 1989; Polovina, 1991; Grossman et al., 1997; Pickering and Whitmarsh, 1997). In Malaysia, the traditional small-scale fish aggregating devices FADs or artificial reefs ARs is an age-old practice among the purse seine fishermen since the early 1990s (Yahaya, 1994). Fishers usually used coconut fronds weighted with rocks or cement to attract and aggregate the fish, thus increase the catch. Various management approaches exist in artificial reef locations such as private management, centralized management and co-management. The Department of Fisheries, Malaysia (DOFM) and the Fisheries Development Authority of Malaysia (FDAM) have been involved in the artificial reefs program since 1975. The ARs (known as "*tukun tiruan*") deployed by the Department of Fisheries Malaysia aims at promoting resource conservation, while the Fisheries Development Authority Malaysia (LKIM) deployed the Fish Aggregating Devices (known as *unjam*) to enable artisanal fishers to secure access to fish around the structures.

The government has undertaken a massive ARs development program over the past 35 years, 1975-2010 and a total RM 49 million has been spent for these programs. The materials used range from scrap tyres, tree trunks, and derelict boats to modem highly sophisticated pyramidal or cuboid structures made of concrete (Yahaya, 1994). Since 1986, various concrete materials have been used for ARs and FADs, including concrete, reef balls, PVC, ceramics, abandoned oil rigs, and cuboids of various shapes and designs. These structures have been designed to aggregate demersal fish and pelagic fish (Azni, 2008). Artificial reefs serve a variety of functions, ranging from the traditional practice of fish production and aggregation to mariculture, tourism and resource conservation (Seaman, 2002). The main purpose of FAD or *unjam* was to use it as fish sanctuary in marine fisheries, provide user rights to the fishers to fish surrounding *unjam*, to encourage various business activities to support fishing and local tourism. The Department of Fisheries Malaysia deployed several large AR structures including concrete cubes, cuboids, soft bottom, lobsters, and tetrapod in recent years. The main justification for deploying these durable structures was to protect inshore fisheries from trawls as well as increase the productivity of fish (DOF, 1985). The Fisheries Development Authority (FDAM) deployed ARs over 550 locations throughout Malaysia until 2010 (Azmi and Yazid 2008). However, several hundred units of fish aggregating devices have been deployed by private individuals and fisher groups in different locations in coastal areas in Malaysia over this period. However, the FDAM received relatively more funding from the government compared to the DOF for the artificial reefs programs.

4. Co-management and Fisheries

Community-based co-management (CBCM) is a people-centered, community-oriented, resources-based partnership approach in which government agencies, the community of local resource users, nongovernment organizations, and other stakeholders share the responsibility and decision making authority for the management of a fishery (Kuperan *et al*., 2003; Berkes et al., 2001; Pomeroy, 2001; Pomeroy and Williams, 1994; Sen and Nielsen, 1996; Nik Mustapha *et. al,* 1998). The idea of fisheries co-management is that communities and the state should work together to manage fisheries and such cooperation will lead to more effective governance of the resource by the people dependent on the resource. This involves the fishers and the resource managers working together to improve the regulatory process for governing the resource.

CBFM is a process that moves towards a substantial role for fishers in management of the resources they depend on within a framework of government support for that process. There is a hierarchy of co-management arrangements where the fishers are merely consulted initially by the government, but later on, when regulations are introduced fishers are involved in designing, implementing, and enforcing laws and regulations with advice and assistance from the government. Berkes et al. (1991) argued that a more precise definition is probably inappropriate, for there is in practice a continuum of co-management arrangements, similar to the view of 'ladder of citizen participation' showing the degree to which citizens share power in government decision making (Arnstein, 1969; Berkes, 1994). The ultimate goal for co-management is to empower fishers in the expectation of better management (Viswanathan et al. 2003). Local institutions are important prerequisites for effective co-management because they are to make decisions and undertake collective actions (Kalikoski et al., 2002; Noble, 2000). Top-down legislative changes which focused on regulation and enforcement to control fishing efforts has failed to prevent over-exploitation of fisheries resources. Pomeroy and Viswanathan (2003) pointed out that most of the coastal and inland fisheries in Asia are still over-fished. It is argued that the failure is because this form of management is very much still a centralized top-down approach, focusing on objectives relating to fish resources and based exclusively on formal biological science (Viswanathan et al. 2003) and mostly disregards the experiences of fishers (Dengbol 2003). As a result, the modern laws and regulations that have been put in place to manage fisheries has not been well accepted by resource users, leading to the

violation of these regulations by fishers whether they are industrial, medium-scale or individuals fishing for their daily food and income and the practical failure of governments to enforce the regulations due to a lack of resources (Viswanathan and Sutinen, 1998). Since the 1960's the participation of local resource users and communities in development and management has become part of the development process in Southeast Asia. However, community organizations are rather weak in co-management in Asia. There is an increasing commitment of the Southeast Asian governments to decentralize policies and community-based resource management. In developing countries community management and co-management approaches that involved the crafting of new institutions at the local and community level appeared. These movements reflect a paradigmatic shift in fisheries management, both in terms of balance between overall goals and balance in the distribution of authority and power (Siar et al., 2006; Jentoft and Mccay, 2003; Hanna, 2003). Co-management and community-based management of fisheries is becoming central to the idea of effective governance of fisheries. Gutierrez, Hilborn and Defeo (2010) in their examination of 130 co-managed fisheries from 44 countries with different degrees of development, ecosystems, fishing sectors and type of resources concluded that strong leadership is the most important attribute contributing to the success of co-management. The first comprehensive global assessment of social, economic and ecological attributes contributing to fisheries co-management success shows that co-management holds great promise for better governance of fisheries worldwide in terms of realizing the outcome of sustainable fisheries. The potential for any governance structure for improving fisheries management depends on proper incentives, decentralized institutional arrangements and cohesive social organizations. All of these are more likely to happen under well-established co-management regimes. The participation of fishers and other stakeholders reduces the negative economic, social and cultural impact that is traditionally borne by the fishing communities (Lane, 2001). Pomeroy and Ahmed (2006) stated that the potential benefits of co-management include a more open, accountable, transparent and autonomous management process that is more economical as it requires less cost for administration and enforcement. An effective co-management framework may generate benefits for resource users, local communities' conservation and under this arrangement, poverty and resource degradation can be reduced (Brown et al., 2005).

In this paper, co-management is used to mean the sharing of rights and responsibility between the government and fishers. The DOF and the fisheries development authority of Malaysia have provided support to the poor fishing community to secure access rights in the marine fishery in the sea and manage fisheries under various institutional arrangements.

5. Fisheries Co-management in Malaysia

In Malaysia, community-based fisheries management approaches have been implementing over the last two decades. Most of the community-based projects have been driven by the federal government. However, the support towards community management is poor. The government has included community management in the Ninth National Plan; however, there is a lack of agency capacity to support and integrate cooperation (Nopparat, 2009). This section discussed case studies of various co-management arrangements that have been emerged through the initiative of the government and resource users in Malaysia.

5.1 Co-management in Sabah

A traditional community-based approach locally called *tagal* system has been implementing in the freshwater inland river systems in Sabah - one of the federal territories in East Malaysia. The meaning of *tagal* system is 'fishing in river is prohibited by the concerned communities' for a certain period. The local community initiated the management of fisheries in various locations in

Sabah. The Department of Fisheries Sabah (DoFS) has extended support to promote this Community Based Fishery Resources Management (CBRM) approach since 2001. A total of 240 *tagal* fisheries group have been established and registered with the Department of Fisheries Sabah. Local people who have traditional use rights in the river sections were included in the *tagal* fisheries group. Community leaders were selected at the village level who introduced fisheries activities with administrative support from the Department of Fisheries Sabah. The members of *tagal* fishers participated in various fisheries activities. The Department of Fisheries Sabah provided technical support to the organized fishers. The main activities of the *tagal* organized fishers were to protect their fish stocks from poachers, reduce overfishing, protect from illegal fishing practices and other activities that pollute the water bodies. They have established fish sanctuaries and prohibited the use of destructive fishing gears.

The fisher groups have promoted eco-tourism activities which have been successful in *tagal* fisheries project areas. The communities with support from the DOF have acquired the power to resolve social conflicts and violations of rules over fisheries through the village headman or district court. The *tagal* co-management approach has been recognized by the government as this approach has empowered local fishing communities (Sujang and Etoh, 2009). Although the *tagal* co-management approach is promising, they have not been successful in some areas due to weak institutional arrangements, lack of monitoring and enforcement, inadequate credit support, and shortage of government staff.

5.2 Co-management in Langkawi

The government initiated a co-management project in Langkawi in the west coast of Peninsular Malaysia. The Locally Based Coastal Resource Management in Langkawi (LBCRM-PL) a pilot project was implemented jointly by the Department of Fisheries Malaysia and the Southeast Asian Fisheries Development Center (SEAFDEC), and was supported by the Japanese Trust Fund (JTF) from 2001 to 2007.

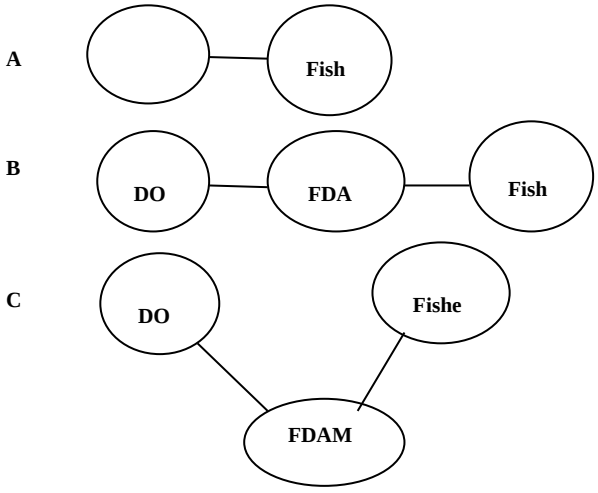

Fig. 1: Models of interactions between the Department of Fisheries, Fisheries Development Authority Malaysia (LKIM), and Fishers in fisheries co-management in Malaysia. Source: adopted from Berkes (1994) and Ahmed et al. (1997).

The Fishery Resource Management Community (KPSP) was organised by the Department of Fisheries Malaysia in several fishing communities in the project area. The DOF provided administrative and technical support to the organized groups. The groups were actively involved in fisheries conservation activities in the project area such as replantation of mangroves, and installation of artificial reefs. In Langkawi, the protection and monitoring of DOF artificial reef sites were managed under a co-management approach between the DOF and the local fishing

community. The Implementation Coordination Committee (ICC) was formed with representatives from the Department of Fisheries, SEAFDEC, fishers and other stakeholders identified from the village. The organized fishers have participated in the project meetings and were able to prepare fisheries resource management plans to implement fisheries management activities. The SEAFDEC and DOF took a major role to play in making institutional arrangements for project implementation. Several fisheries resources management committees were formed under the supervision of the Department of Fisheries and the Fisheries Development Authority of Malaysia (DOF and LKIM). The fisheries management approach has moved from traditional towards a more holistic and ecosystem-based approach (SEAFDEC, 2009). However, due to an inadequate number of DOF staff and lack of access to financial credit sources in the project sites, the implementation of co-management planned activities was not sustainable (SEAFDEC, 2009).

5.3 Participatory management in Fish Aggregating Devices and Artificial Reefs

5.3.1 Department of Fisheries (DOF) and Fisher model

The Department of Fisheries Malaysia (DOF) has deployed artificial reefs or *tukun* with financial support from the government. The main objective of ARs deployed by the DOF was to protect fisheries resources from trawls and to increase biomass and productivity especially in the inshore area. The DOF had imposed fishing restrictions in the immediate vicinity up to a radius of 0.5 nm of its ARs. The DOF had marked the AR locations by marker buoys (DOFM 1985; Jothi, 1986; Wong, 1991). The DOF carried out a technical investigation before deploying the structures. However, local people were not informed and consulted about the location and management of these artificial reefs. Local people did not participate to the artificial reefs program. The fishers suspected the DOF's role to secure their rights to fish in the ARs area. The fishers did not get incentives to protect these ARs from trawls and outside fishers. Moreover, the marker buoys were removed from the ARs. Various fisher groups have conducted fishing surrounding the AR structures. The DOF did not assign use rights to fisher groups, but it has been observed that fishers have become the custodian of most of the ARs. However, the DOF artificial reefs have been less or not protected from fishing, due to a lack of enforcement and local cooperation. The objectives of the AR programs to protect fisheries habitat from trawls have not been achieved, due to lack of proper planning, use of AR materials, site selection and poor monitoring and enforcement (Saharuddin et al., 2012). The existing management arrangements are not sustainable for fisheries where the DOF is solely responsible to manage ARs.

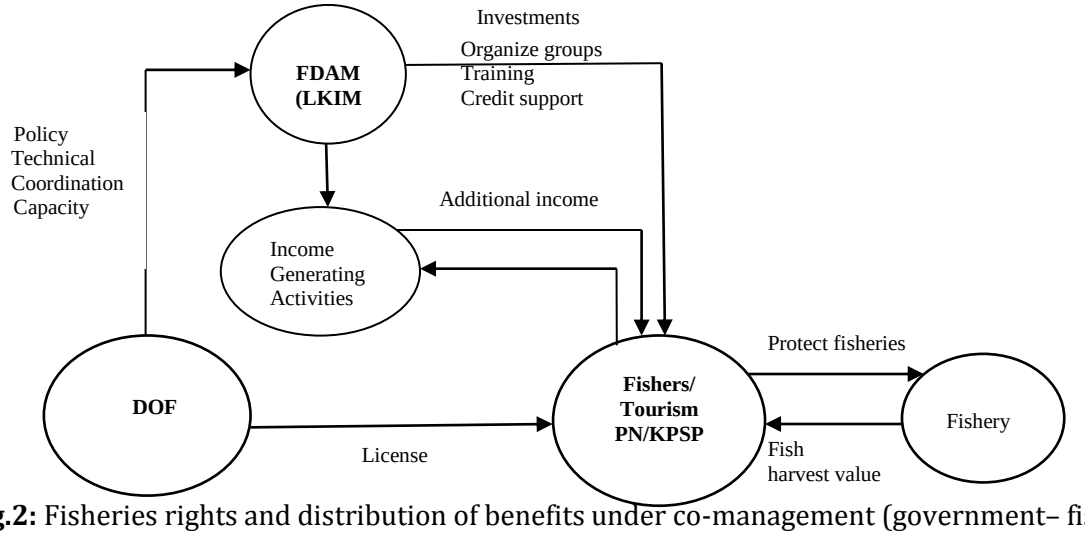

Fig.2: Fisheries rights and distribution of benefits under co-management (government– fisher) partnership approach of fisheries management in Malaysia. Adopted and modified from Ahmed et al. (1997).

In addition to the *tagal* co-management in inland riverine fisheries in Sabah, the protection and monitoring of most DOF artificial reef sites have been managed under a co-management approach between the DOF and local fishing community. The AR committee comprising of locally organised fishers are responsible to protect, monitor and harvest fish in a sustainable manner. Fishing effort was limited to angling, other fishing gears were prohibited within and near the AR sites. They are successful in protecting AR from illegal fishing and the awareness about habitat management improved. This co-management approach is an example of DOF-Fisher model, no NGO is supporting this co-management process.

The DOF provides licenses to fishers based on the fishing boat and gear. Fishers failed to establish formal fishing rights in the ARs that belong to the DOF. In this co-management model (model A in Fig, 1) the DOF provides support for the management of ARs, where the FDAM has limited or no direct role in co-management. The fishers did not get support from non-government organizations (NGOs).

5.3.2 *Fisheries Development Authority (LKIM) and Fisher model*

Fish aggregating devices or *unjam* deployed by the Fisheries Development Authority (FDAM) with financial support from the government. The main purpose of deploying FADs in the coastal areas was to secure access to the poor fishers for improving their economic condition. The *unjams* were deployed mainly at the request of artisanal fisher groups or fishermen associations from the fishing community in coastal areas. These groups had also participated during the deployment and mooring of these *unjam*s and subsequently become the main beneficiaries of FDAM. The fishers groups have eventually become self-appointed custodians of these *unjam*. The fishers have protected the devices from other fishers who do not belong to their group. The fisher groups have established their user rights to these *unjam*, have established *de facto* property rights. This partnership arrangement was acceptable to the government agencies and subsequently developed a partnership between FDAM and fisher groups (model B in Fig. 1). There is no license fee imposed on the *unjam* users. A variety of materials and designs were used to attract demersal and pelagic species. The main motivation for the local fishers is that the FADs were built for improving their economic conditions through fishing and tourism activities. The FDAM and the users worked out the rights and responsibilities over the FAD structures. However, the FADs were seen to be publicly owned with fishers having unlimited access, where the fishing community was less motivated to protect their resources.

5.3.3 *Management of privately owned Artificial Reefs*

Traditionally fish aggregating devices or artificial reefs have been constructed and owned by individual boat owners (purse seiners) or groups of boat owners. The owners of these FADs are generally the rich people called *toukays* or fishery merchants. The fishery investors are called fishery agents or fishery lords in other parts of Southeast Asia. The agents provide credit and fishing equipment to the fishers and get a higher return from fishing. The owner of the FADs has developed an exclusive management regime over the fishery surrounding the FADs. They can manage their FADs with administrative support from the Department of Fisheries and Fisheries Development Authority. The private *unjams* are made primarily of coconut fronds and their placement is not restricted to the 0-5 miles waters (Jahara 1994). However, various size and designs of FADs with scrap materials, treetrunks and bamboos were deployed to attract fish. The owner used about 20 units of FADs for one cluster and each owner has got 100 clusters deployed in the coastal areas.

Generally, the FAD owners do not take part in fishing activities. They usually rent out their FADs and transfer the use rights to others. The owner of the FAD is responsible to maintain their FAD structures every year. They obtain technical advice from local DOF staff. The groups have also introduced an acceptable benefit-sharing system in the FADs. In this system, the owners were able

to govern access rights and use of the fisheries resources. The fishery has been no longer open-access common property. The coastal public waters have been gradually privatized through the construction of FAD or ARs in coastal waters in Malaysia.

The privately-owned FADs are also managed jointly with Fishermen's Association (Persatuan Nelayan Kawasan). The Fisheries Development Authority provides financial support to the artisanal fishers to undertake various income-generating activities. In this participatory approach, the owner of the *unjam* transfer all management and maintenance responsibility to the fisher groups. The fishers pay a share of their income from fishing to cover the construction costs of FADs. Benefits from fishing were distributed among fishers. The fisher groups have subsequently the owner of some structures after paying all the construction costs. The fisher groups finally the owner of these FADs. The fisher groups get technical, organizational and credit support from Fisheries Development Authority (LKIM). The DOF also provided technical support to the organized fishers. These arrangements have developed a partnership between the DOF, LKIM and fishers. The management approach between the government and fishers is an ideal co-management arrangement where NGO support is lacking (Berkes, 1994).

The fisher groups are homogeneous; they live in the same community using artisanal gear such as handline, trap, driftnet and purse seine. Fishers have participated in fishing activities, protected their FADs from other fishers and distributed their benefits among fishers. The support towards community organisations for this co-management approach is still slow due to the lack of institutional and legal support to the fishers. The FDAM initiated to provide "user rights" to the artisanal fishers over the fisheries resources around *unjam*. They have encouraged fisher groups to be responsible for effective resource management and conservation practices. This approach has created incentives for the fishers to participate in fisheries and ensure equitable access.

6. Discussions

The centralized management approach implementing in Malaysian fisheries has been proved ineffective. The licensing policy has secured rights to fishers to fish in the assigned fisheries zones, but fishing competitions have continued to increase in inshore fisheries. The encroachment of bottom trawls in the inshore areas has intensively exploited the fisheries habitat. The Department of Fisheries deployed artificial reefs which have been used as anti-trawling devices in the inshore coastal areas. However, fisheries are not protected from trawls due to a lack of enforcement and monitoring. The current management policy failed to resolve the problem of fisheries overexploitation and inequitable benefits from fisheries. It is widely recognized that community management with strong local institutions can be a solution to these problems in fisheries and can attain sustainable and equitable management of fisheries. The Department of Fisheries and the Fisheries Development Authority are the two most important government agencies responsible for fisheries in Malaysia. The DOF and FDAM have been providing support to fishers to achieve economic, social and conservation objectives in coastal fisheries. The co-management arrangements have developed through the initiatives of local people in the coastal community in Malaysia over the last two decades. The existing co-management approaches in Malaysian fisheries have been discussed in this paper. The Department of Fisheries was the main partner of *tagal* fisheries in Sabah, co-management in Langkawi coastal fisheries and co-management in artificial reefs in several coastal areas in Malaysia.

The DOF has provided licenses and organized poor fishers in the coastal communities in Sabah and Langkawi shown in model A in Fig. 1. In this model, the fishing community participated in resource management activities with administrative support from the DOF. The FDAM provided fisheries subsidy and other livelihoods support to the local fishers to promote income-generating activities and the welfare of fishing communities. However, institutional support was rather poor in fisheries community management in Malaysia. Fishers have not achieved organizational strength to deal

with the government directly. It was found that the organized fisher groups did not get enough institutional support from the DOF and FDAM. The organized fishing groups were not successful in protecting their fisheries from trawls and other illegal fishing activities.

The DOF and FDAM have provided institutional support to poor users and to establish a partnership arrangement to achieve social, economic and conservation objectives is shown in model B in Fig.1. The FDAM play an effective role to strengthen the community institutions through providing access to fisheries and venturing into other commercial activities. The FDAM has provided operational support to the fisher groups and provided credit support to invest in various income-generating activities. The participatory co-management in FADs and artificial reefs fisheries has demonstrated the partnership arrangement of DOF-LKIM-fishers shown in model B in 1. The FDAM has played a greater role in securing user rights to fish surrounding the FADs. The fishers were organized under the LKIM framework, fisher leaders were selected through the democratic process, and they were responsible to manage their FADs with technical and administrative support from FDAM and DOF local staff. This institutional support has strengthened the social, economic position of artisanal fishing communities, and created a sense of ownership over the fisheries.

However, the management of artificial reefs has demonstrated that the DOF did not incorporate local fishers in the planning and management of the AR programs. The government allowed private individuals to deploy FADs where they have established their *defacto* property rights. The relatively rich people invested in FADs and major benefits go to the private owner of these structures. Due to the free access to fishing in the ARs areas; most productive parts of artisanal fishers are continued to capture by the rich people with employing more effective gears. The FAD owners have established exclusive fishing rights in the area which means that fishing intensity increases that pose threat to fisheries resources, the resources will be further depleted. These will affect negatively on the sustainable catch and incomes of artisanal fishers.

The ARs and FADs with concrete structures were not suitable for fishing, especially for the drift net users. The hand line, long line and traps user were able to fish around AR areas without any serious problems of entanglement. Social conflicts arise due to an entanglement problem between fishing groups using same locations (Islam et al, 2014). Sutton and Bushnell (2007) highlighted that conflicts within groups of AR users usually come about due to crowding and congestion at AR sites.

Several studies suggest that management of AR should be consistent with fisheries management, e.g. to avoid stock overexploitation, through unexpected reallocation of fishing effort over space around AR (Polovina, 1991; Botsford et al., 2003; Denny and Bobcock, 2004). Pickering and Whitmarsh (1997) argue that ARs have serious problems of distribution in the absence of an effective management strategy.

There is a need to have more flexible and community-oriented management of the fishers. The DOF and FDAM should be willing to accept each other's role. This would require poor fishers as stakeholders and put in place mechanisms that would serve to foster closer DOF, FDAM, and community linkages. Sufficient extension services to the target groups are required to enable these community-based organizations to perform useful functions. Local credit institutions including banks should introduce a simple credit delivery mechanism to supply adequate financial credit to the fishers. Sufficient, timely and sustained funding is critical to the sustainability of co-management efforts. Often co-management projects which are initiated and funded from outside sources fail when the project finishes due to the inability of the partners to fund the activities.

The excess fishing problem is generally found in the fishers due to unclear property rights. The existing property rights arrangements are complex in Malaysia and other Southeast Asian countries. Fishers and community members have low incentives to contribute to the community fishery. Without seeing any tangible benefits, community members are less willing to invest time and effort in fisheries management.

Individual and community empowerment is a central element of co-management. Empowerment allows communities to be free from the bureaucratic requirements of government agencies. The experience shows that there is a lack of capacity building, confidence and a sense of empowerment of resource users. The co-management experience suggests that FDAM could play a very important role in facilitating to establishment local co-management. The focus of co-management is on building fisher community organizations that can themselves manage fisheries through interaction with the government. It has been observed that homogeneous communities are more likely to establish effective community-based fisheries management. Successful co-management was dependent on the high level of socio-economic and cultural homogeneity of the community. However, the co-management project was also successful in socio-economically and culturally heterogeneous communities. In Malaysia, none of the co-management groups is graduated and become self-sufficient. Establishing sustainable co-management in any one fishery requires time. The capacity of the CBO needs to be established as a sustainable organization and a legitimate decision-making body to decide on access and use of the fishery. Strong political will and commitment are needed to counter pressure from fisheries agents and intermediaries. An ownership feeling should come through the active participation of fishers.

7. Conclusion

Fisheries co-management as an alternative to centralized command and control fisheries management is often suggested as a solution to the problems of fisheries resource use conflicts and overexploitation. In Malaysia, community-based fisheries management has been experimenting over the last three decades. Co-management programs implemented in inland riverine fisheries in Sabah have demonstrated that the organized fishers can effectively manage their resources with support from the Department of Fisheries. The co-management model has established between government and fishers seemed to be more sustainable and equitable management in fisheries. Co-management has also demonstrated in coastal marine resources in Langkawi with a similar co-management framework where the Department of Fisheries has provided major institutional support to the local fishing communities with technical and financial support provided by the Southeast Asian Fisheries Development Centre (SEAFDEC). Various management approaches exist in fish aggregating devices or unjam deployed in various locations in coastal areas in Malaysia. The organized fishers have established their use rights in FADs installed by a private individual and by Fisheries Development Authority Malaysia. The DOF provides license to the fishers for fishing with particular gear. The FDAM has provided organizational support, registration of fishermen association, credit and other livelihood support. This co-management has developed with the partnership of DOF-FDAM-fishers in many locations in the coastal areas. The co-management arrangements are still experimenting and none of the co-management groups have successful. The process of reformation from traditional centralised management to community-based decentralised management is extremely slow in Malaysia. The Malaysian Government has included community-based management policy in the Ninth Malaysia Plan 2006-2010. The Government has encouraged the community to participate in enforcement activities: monitoring, control and surveillance (MCS). However, there is a lack of agency capacity to provide institutional support to fishers. There is a danger to allow a private individual to deploy FADs. The issue of ownership of these resources is not clear. The process of privatization of public waters is unsustainable and it will create a negative impact on the distribution of benefits.

The poor fishing groups were not able to secure user rights to fisheries. Therefore the sense of ownership in their resources has not been established. The increasing number of FADs are occupied the fisheries' habitat especially in the near shore areas. The main issues are ownership, accessibility; use rights and the overall management of fisheries resources around these structures.

There is a need to find a mechanism to empower target groups who could enforce the fisheries rules and protect fisheries resources. The experiences from Southeast Asia indicate that the establishment of CBFM and co-management takes time but once established, this management regime can bring about improved efficiency, equity and sustainability of resource use. The main obstacle in fisheries is the lack of coordination between the DOF and FDAM. There is a dilemma about the role of DOF and LKIM towards the welfare of fishers. The agencies should have clear goals and expectations in fisheries management. The DOF is reluctant to share their regulatory power to the FDAM, moreover, they have an artificial reefs program with a different desire. The role and operational strategies among the agencies and stakeholders should be clearly understood. The fishers do not have direct communication with the DOF. There should be a communication channel to inform the fisheries issues. Effective coordination of FDAM and DOF are not easy to establish but are extremely necessary to support new community institutions for fisheries management. The important policy implication is that the fisher groups of co-management organizations need strong facilitation by DOF and FDAM to establish access to fisheries. Successful co-management is more likely to occur in homogeneous communities. The long-term commitment is required for the sustainability of fisheries associations. Many co-management projects have been supported by donors for extended periods. The sustainability of co-management projects is often an issue when they are donor-driven and heavily dependent on external funding. To improve performance and strengthen partnership, DOF, FDAM, PNK and other stakeholders have to go through a social learning process and be willing to accept each other's roles and responsibilities.

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