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Ching-Ta Chuang
Institute of Marine Affairs and Resource Management, National Taiwan Ocean University, Keelung, Taiwan, R.O.C

Jun-Yu Chen
Department of Finance and Insurance Management, Lan Yang Institute of Technology, Yilan, Taiwan, R.O.C., junyuchen@ntu.edu.tw

Kuei-Chao Chang
Institute of Ocean Technology and Marine Affairs, National Cheng Kung University, Tainan, Taiwan, R.O.C.

Li-Wen Hung
Institute of Marine Affairs and Resource Management, National Taiwan Ocean University, Keelung, Taiwan, R.O.C.

Ta-Kang Liu
Institute of Ocean Technology and Marine Affairs, National Cheng Kung University, Tainan, Taiwan, R.O.C.

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CRITICAL SUCCESS FACTORS ANALYSIS OF IMPLEMENTING MPA AT THE YILAN GUEISHAN ISLAND, TAIWAN

Ching-Ta Chuang[1], Jun-Yu Chen[2], Kuei-Chao Chang[3], Li-Wen Hung[1], and Ta-Kang Liu[3]

Key words: stakeholders, marine protected area (MPA), Gueishan Island, co-management.

ABSTRACT

Gueishan Island, located along the strong Kuroshio current, is one of the most essential fishing grounds in Taiwan's offshore fishery, and critical during its transitional fishery periods. However, long-term pollution, overfishing and rapid coastal development result in overexploitation and adverse environmental and ecological impacts. Previous studies focused on single species fishery management or merely the interpretation relevant laws whereas the views and perceptions of the stakeholders are often overlooked. Therefore, stakeholders' participation and co-management seem to challenge the future establishment of a Marine Protected Area (MPA) in Gueishan Island. This study focuses on the evaluation of stakeholders' perception and analyzes the critical success factors for MPA planning through semi-structured interviews and questionnaires. The results showed that although most fishermen do not fully understand the intention of MPAs, they pay much attention to the negotiations among stakeholders before an MPA is implemented. Thus, stimulating appreciation and education about conservation and MPAs is crucial while setting up a co-management mechanism is recommended for the implementation of such MPA.

I. INTRODUCTION

Overexploitation of fisheries resource has resulted in marine resource depletion. Around the globe, as much as 95% of large fish resource have been overfished and 75% of commercial fish population are facing the risk of col-lapse [22]. In recent years, fisheries conservation meas-ures have shifted focus from the traditional maximum sustainable yield (MSY) to new ideas such as precautionary principle, ecosystem management, integrated coastal zone management and sustainable utility. Meanwhile, nations have started to value the importance of conservation and protection of natural resources, and there have been active calls for conservation of marine ecosystem and expansion of marine protected areas (MPAs). Moreover, during the first International Marine Protected Areas Congress (IMPAC1) held in Australia in 2005, the necessity of establishing a global MPA system against the disappearing marine resources was mentioned.

Gueishan Island has been an important fishery area with a diverse ecological system. It supports fishing industry and tourism, which provides a major source of income for Toucheng Township of Yilan County. The island has unique marine structures and resources, such as shallow water hydrothermal vents, Gueishan eight sceneries, and the presence of *Xenograpsus testudinatus*. However, this rich marine ecosystem is facing the threat of overexploitation, thus it was included into the marine national park program in the Ocean Policy White Paper. In the past, researchers focused largely on geological studies and biodiversity, while research on the protection and management of the overall ecosystem was rather sparse. Therefore, this study aims to assess the possibility of establishing an MPA system in Gueishan Island, which is the most economic and effective way of conserving the ecosystem [22]. In addition to regulate related conservation policies, the government should also apply participative and a co-management to include fishermen's concepts, opinions, and ideas into the implementation of MPA measures. This study attempts to understand and discuss the issue of establishing MPA in Gueishan Island from fishermen's viewpoints. Furthermore, it is expected that by analyzing the possibility of planning a MPA in Gueishan Island, this study can explore the factors in the success of MPA programs

Paper submitted 06/23/11; revised 04/20/12; accepted 06/28/12. Author for correspondence: Jun-Yu Chen (e-mail: junyuchen@ntu.edu.tw).
[1] *Institute of Marine Affairs and Resource Management, National Taiwan Ocean University, Keelung, Taiwan, R.O.C.*
[2] *Department of Finance and Insurance Management, Lan Yang Institute of Technology, Yilan, Taiwan, R.O.C.*
[3] *Institute of Ocean Technology and Marine Affairs, National Cheng Kung University, Tainan, Taiwan, R.O.C.*

and propose feasible measures to help the government to implement marine protection policies.

II. RESEARCH PROCEDURES AND METHODS

In order to achieve the objectives of this study, research procedures are described in the section below. First, a review relevant important literature, including theories such as theory of marine conservation area, public wealth, citizen's participation and co-management, etc. was carried out. Second, stakeholders were identified and their level of participation was determined. Third, secondary data was complied and field data collection planned. Fourth, data was collected and stored in a spreadsheet. Finally, data was analyzed and conclusion were drawn based on this analysis.

This study included both a questionnaire survey and in-depth visiting survey. Questionnaire survey focused on two townships (Toucheng and Suoa) and the respondents were composed of fishermen, staff of fishermen's associations, and fisheries experts and scholars. The initial survey addressed specific issues in particular ocean areas, as a result purposive sampling was applied to collect representative samples. The design of the questionnaire was based on Delphi sampling, and its contents included basic information and current status of fishing operations, the understanding of marine resources in Gueishan Island, fishermen's opinions and ideas about the establishment of a MPA in Gueishan Island, and fishermen's cooperation and expectations of an MPA in Gueishan Island. A total of 380 questionnaires were distributed, and 212 valid questionnaires were collected. The response rate was 55.8%. The number of respondents interviewed is shown in Table 1 below.

The in-depth visiting survey used semi-structured interviews for stakeholders, and was carried out in order to survey relevant MPA issues and concerns of the various stakeholders. There were seven interviewees; five local fishermen or representatives, two persons are the personnel of government unit.

Table 1. The number of respondents interviewed.

interviewee	number of questionnaire	number of respondents	valid sample	invalid sample
fishermen	322	163	162	1
Staff of fishermen's associations	30	30	30	0
fisheries experts and scholars	28	18	18	0
Total	380	312	212	1

III. REVIEWS OF FUNDAMENTALS OF MPA THEORY

1. The Establishment of Marine Protected Areas

Oceans around the world have been damaged, polluted, overfished, and overexploited, which have resulted in the rapid reduction in biodiversity and fisheries resource. Moreover, less than 1% of the world's oceans are under complete protection. During the first World Conference of National Parks in 1962, the concept of MPA was proposed as an effort to raise international awareness and encourage the developments of national parks internationally. During the first International Marine Protected Areas Congress in 2005, participants once again stressed the necessity of expanding global MPA systems by 12% and enhancing high sea conservation efforts by 2012 as measures to realize the protection of marine biodiversity.

There are various types of MPA, but the spirit and the goals are basically the same. In 1998, The World Conservation Union (IUCN) specifically defined MPA as "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or the entire enclosed environment." Phillips [17] proposed nine goals for MPA management as behavioral guidelines for MPA establishment. Oceans do not have specific boundaries, so establishing MPAs is not as easy as establishing protected areas on land. As such, zoning is an efficient way of management. Browman and Stergiou [1] indicated the following benefits of establishing MPAs: restock overfished species, protect habitats and biodiversities, sustain the ecosystem, buffer ecological changes, and serve as a biological comparison for developing areas. In the past, stakeholders were against the establishment of MPAs because they believed that it would restrict their utilization of marine resources and affect their rights to fish and further develop tourism. However, research has established that the spillover effect following the establishment of MPAs can synergistically improve the efficiency of resource conservation. Roberts *et al*. compared the use of small marine reserves on two different fishery activities in Florida (United States) and St. Lucia, and found that both had significant spillover which improved the adjacent fisheries [19]. In the Philippines, Russ *et al*. reported higher catch rates, decreased fishing effort and enhancement of total catch over a 20-year period after the establishment of a marine reserve [20].

2. Public Participation and Co-management

To address issues of commons, many nations encourage stakeholders such as local government, non-government organizations, and local residents to apply the "co-management" model. This aims to achieve the goal of sustainable development through the binding force of social norms, public participation, and privatization of commons. Chuang *et al*. [7] pointed that a top-down implementation could easily cause conflicts of interests between stakeholders and the government. Additionally, competent authorities would find it hard

to properly convey ideas and benefits, and stakeholders would be clueless about how to have their demands heard. The application of co-management can improve such a situation. To realize public participation, it is suggested that fishermen should be allowed to gain understanding of MPA and its potential benefits. Furthermore, there should be an appropriate compensation mechanism or alternative measures to serve as an effort to consider fishermen's livelihood. Only by incorporating local interests can MPAs be established successfully [3].

Public participation is necessary for the implementation of fisheries resource conservation and restoration; moreover, it can bring substantial benefits to local communities. To establish an efficient management mechanism, it is necessary for all parties involved to co-organize task forces for conservation zones. Such management requires the adoption of task forces and consultation from experts and scholars, authorization and subsidies from the government, and cooperation from non-government conservation organizations and the marine industry [2]. Chiau [5] proposed four essential elements of an integrated management: ideals, stakeholders, local resources and environmental conditions, and management patterns. Jentoft and McCay [15] categorized interrelation of stakeholders and policies into instructive, conclusive, and cooperative management strategies. Pinto da Silva [18] proposed advisory and informative strategies, while Chuang *et al*. [6] further added "self-management" to the list. All of these patterns can be addressed as follows [6]:

- Instructive: It is similar to the centralized management in which the government take the lead, have minimum information exchange with stakeholders, and give direct instructions.
- Conclusive: The government consult stakeholders before making policy decisions.
- Cooperative: It is the type of management in which the government and stakeholders are in an equal position in planning and making policy decisions.
- Advisory: Stakeholders take the lead and propose bottom-up decisions to be granted by the government.
- Informative: The government give part of their authorization to resource-using groups, and these organizations are responsible of reporting decisions back to the government.
- Self management: Fishermen take total control while the government give all authorization. Fishermen only need to report back to the government regularly.

3. Marine Protected Areas in Taiwan

Previously, the development of protected areas in Taiwan focused on the conservation of terrestrial environment. Marine conservation, on the other hand, is 20 years behind that of land conservation [14]. Presently, protected areas have expanded from the land to the ocean, but related regulations are still based on land conservation and management. There is no tailor-made legislation exclusively for MPA management in Taiwan. Recently, 26 fisheries resource protected areas have been established in accordance with the Fisheries Act, and seven national parks have been set based on the National Park Act. Dongsha Atoll National Park is the first MPA in Taiwan established in 2007, the coverage of park includes Dongsha Island and area surround the Dongsha Atoll extending outward 22.2 kilometers. The total area is 3,536 square kilometers, it is rich in coral reef landscapes and ecological resource, and is an ideal spot for a wide variety of marine life. The Construction and Planning Agency of the Ministry of the Interior has announced a natural environmental protection plan which includes 12 coastal protected areas (Table 2). The marine territory takes up about 29.43% of Taiwan's total area. Whatever legal basis the establishment of MPA is on, it is the public authorities' ability in implementation that matters the most. Additionally, it is necessary to design no-take zones, set up a biological database, create a compensation system, introduce a sound legislation for protected areas, and establish a negotiation mechanism for public participation in MPA [10].

Table 2. Classification of Taiwan's conservation area.

Item / Type	Category	No	Total Area (ha)	Waters (ha)
Land Type	Natural Reservation	21	65,495	117
	Wildlife Protected Zone	18	25,829	296
	Wildlife essential Habitat	35	324,670	296
	National Park	7	362,113	49,615
	National natural park	1	1,123	—
	National Forest Reservation	6	21,171	—
Ocean Type	Fishery Resources Sanctuaries	26	4,795	
	Marine National Park	1	353,668	353,494
	Coastal Protected Area	12	—	—
	Reef Conservation Area	35	—	—

—: no data.

Source: Natural Conservation COA, 2012.

Taiwan's MPA system has not yet been implemented thoroughly, and its progress is relatively slower compared with that of other nations. Nevertheless, efforts have been made in the development of marine national parks and fisheries resource conservation areas. The forthcoming Department of Oceans and the Coastline Act, the recent plan of including marine areas into the homeland program, and the plan of categorizing sensitive habitats into protection zones of various levels [21], will guarantee the future achievement in marine conservation.

IV. BACKGROUND OF GUEISHAN ISLAND

Gueishan Island is located northeast off-shore to Taiwan and is within the jurisdiction of Toucheng Township, Yilan County (Fig. 1). Being on the route of Kuroshio Current, the waters around Gueishan Island are environmentally complicated and have biologically diverse fisheries with abundant

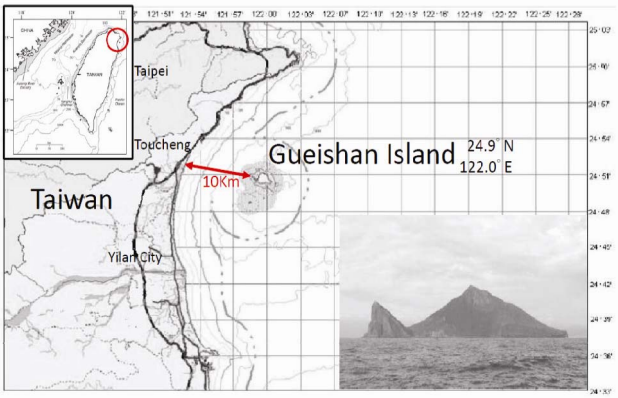

Fig. 1. Location of Gueishan Island.

commercial fish stocks [4]. In the 2006 "Ocean Policy White Paper" [9], it is proposed that Gueishan Island should be included as a MPA for the protection of its hydrothermal vents, whale and dolphin populations, marine biodiversity, and conservation. With the advancement in the tourism industry and after the maritime prohibition was lifted, people in Taiwan are increasingly keen on marine recreational activities. This has not only made Gueishan Island a favorable fishery but also a popular tourist attraction.

Gueishan Island possesses one of the few remaining primary forests, home to 300 varieties of vascular plants and nearly 150 species of animals [12]. The island records a total of 21 families and 33 species of birds, and most of which are not resident but migratory birds. The insects, amphibians, and reptiles on the island take up 15% of the total population found in Taiwan [12]. The waters around the island are rich in marine biological resources and unique in water flow structures. Creatures like marine mammals, commercial fishes and shrimps, and corals gather here [13].

Shallow-water hydrothermal vents of Gueishan Island are very rare ecological environments because most of the hydrothermal vents are located in deep seas. The Xenograpsus testudinatus found in these shallow-water hydrothermal vents in 1999 is a new species of crab [16]. As for the fishery economy, fishing activities surrounding Gueishan Island are mostly inshore fishing, with total volume and value of 84,055 tons and valued at US$3,024,988. This production accounts for 84.62% and 70.91% of the total fisheries volume and value of Yilan County [23]. Though tourism activities surround Gueishan Island were helpful to local economy, they also created some problems like pollution, habitat degradation, biological interference, noises, and landscape imbalance which can easily impact the ecosystem of the marine environment [8]. The marine resource around Gueishan Island are being overexploited gradually. Problems arising from inshore fisheries activities include: weak policy-making mechanism; poor implementation and inefficient solutions in addressing conflicts; the lack of an awareness of precautionary measures in the industry; and shortage of local manpower and funds [11].

V. RESULTS AND DISCUSSION

1. Analysis of Knowledge of MPAs

Collected questionnaires were categorized into fishermen, staff of fishermen's associations, experts and scholars. Respondents' understanding of MPA, attitudes towards MPA establishment in Gueishan Island, and how stakeholders would cooperate after the establishment or during the implementation of MPA, were then examined.

There were 164 fishermen among the 212 valid samples, and 115 of them did carry out fishing activities around Gueishan Island. Over half (78.31%) of the respondents had heard of MPA, but they did not know that some of the MPAs were available for fishing activities; only 46.2% of them knew this information. Most of the respondents, particularly fishermen, had very little idea about MPA planning and management, even though they had heard of it before. This indicated the possibility of information asymmetry during the implementation of policies. 69.34% of the respondents favored the establishment of MPA in Gueishan Island area, and 68.40% agreed with restriction measures on fishing activities in some parts of the waters around the island. As for decision-making patterns, over 2/3 s of the respondents supported that the government should negotiate with the fishermen before making decisions about MPA; they believed this would avoid a gap between policies and actual fishing areas, habitats of marine creatures, and areas with high abundance. For future planning and management, fishermen favored the method in which the government took the lead. The reason was that these fishermen regarded it more decisive and faster for the government to give direct orders. However, experts, scholars, and staff of fishermen's associations believed that the government should work with local authorities, fishermen, or private organizations in cooperative way.

Most of the staff of fishermen's associations, experts, and scholars had heard of MPA (97%, 100%) respectively. They understood the actual implementation methods, and a majority of them sustained the establishment of MPA (93.3%, 100%) as an attempt to conserve the ecological environment and biodiversity of the waters around Gueishan Island. Based on analysis, it is indicated that fishermen did not completely grasp the idea of MPA and co-management. Hence, they expressed opposition immediately after learning the government' plan for MPA. Nevertheless, when it came to what type of management was preferred, they chose the one in which the government took the lead. Contradictorily, in the previous question, they chose that the government needed to negotiate with them for related decisions, and the result is worth considering thoroughly.

According to the structural analysis of the questionnaire (Fig. 2), for fishermen who fished in the waters of Gueishan Island but had never heard of MPA, they definitely opposed the establishment of MPA and the restriction of fishing access to part of the waters (direction: lower-left corner). For those who fished in the waters of Gueishan Island and had

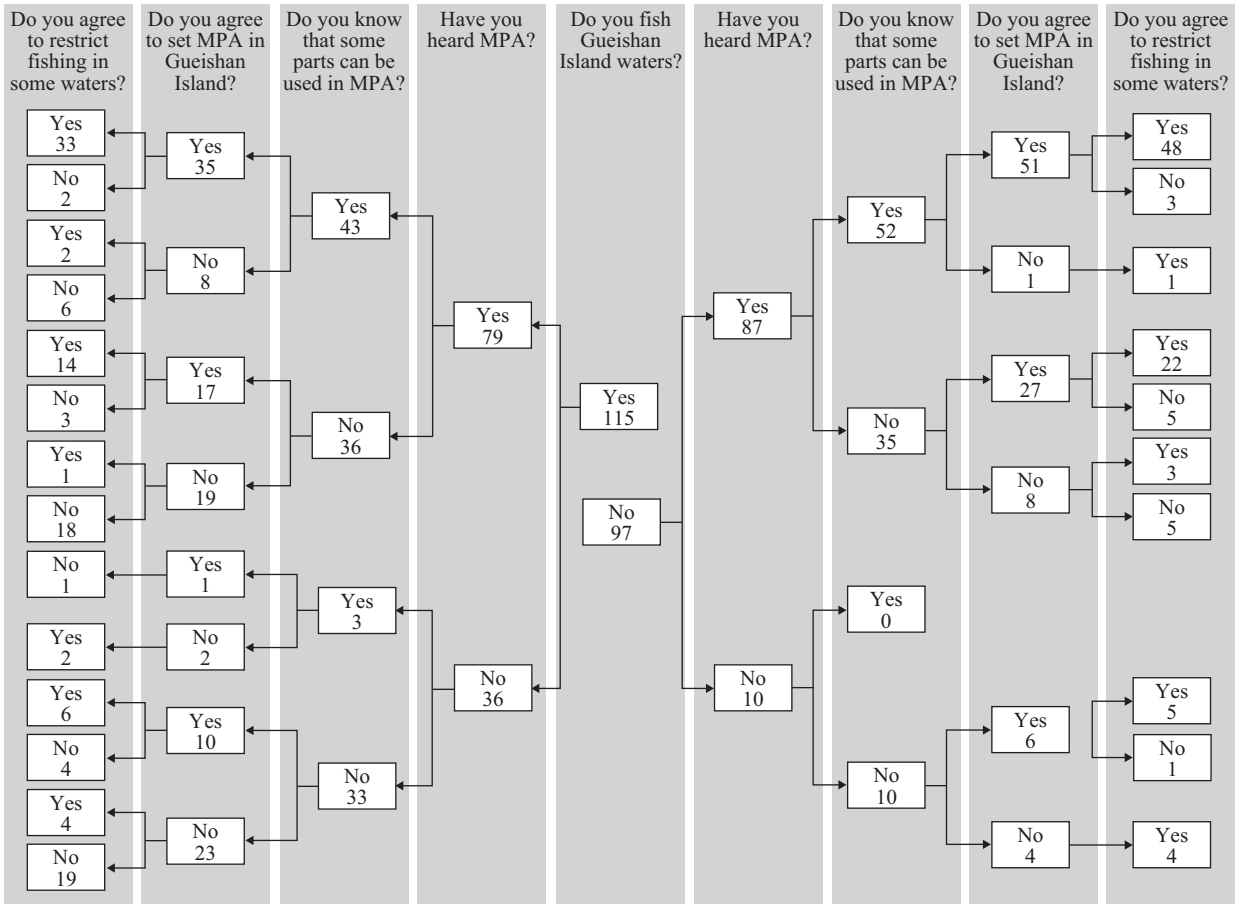

Fig. 2. Questionnaire Analysis.

heard of MPA, they supported the establishment of MPA and the restriction of fishing access to part of the waters (direction: upper-left corner). For fishermen who did not fish in the waters of Gueishan Island but had heard of MPA, they supported the establishment of MPA and the restriction of fishing access to part of the waters (direction: upper-right corner). For fishermen who did not fish in the waters of Gueishan Island and had never heard of MPA, after MPA concepts were explained to them, they still supported the establishment and the restrictions (direction: lower-right corner). This structure chart indicates that as long as the fishermen understood the functions and purposes of MPA, they would keen to the establishment of MPA. However, if the government act willfully and do not promote the functions and purposes of MPA as an effort to increase fishermen's understanding of it, they may incur stout resistance from the fishermen, which will make policy implementation more difficult.

2. The Analysis of the Willingness of Stakeholders

Among all works which require cooperation after the establishment of MPA (Fig. 3), most of the fishermen and stakeholders are willing to assist in "biological conservation and environmental cleanness" and "marine fish species survey and collection". The next activity they were willing to help with is "co-development of biological tourism and related industries". "Cooperation in fish catch restrictions" is the one with least support item; only 31 respondents selected. It was implied that respondents had an embedded concept which made them believed fish catch restrictions would affect their incomes. On the other hand, other works did not make much difference to them, so they were more willing to cooperate.

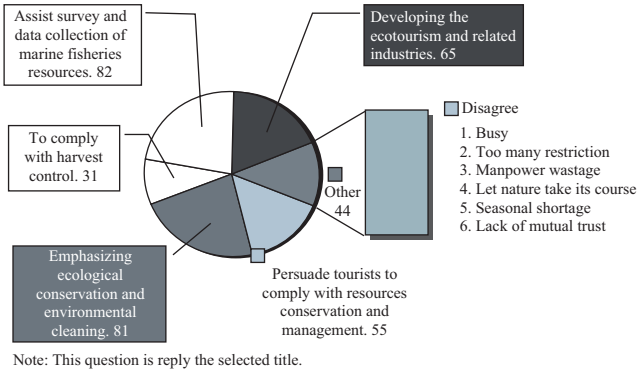

Fig. 3. Items that Fishermen are Willing to Assist with MPA Establishment

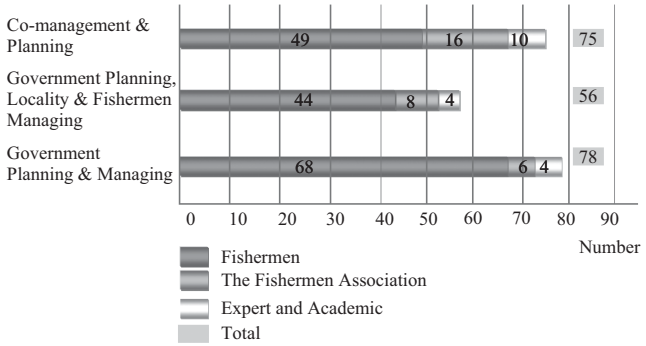

Fig. 4. MPA Planning and Management Response.

Besides, reasons why they did not want to cooperate mainly because the establishment of MPA meant too many constraints and a waste of time in maintenance and cooperation. Some of the fishermen mentioned that there were more seasonal migratory species than demersal species in the waters of Gueishan Island, meaning the fish abundance varied greatly with season. Restriction measures would result in poor predictability of catch and further affect their financial incomes.

3. Analysis of MPA Planning and Management

In the selection of planning and management methods, it was found that most of the fishermen tended to favor government-led management. It was believed that the fishermen still had a conventional mindset in which they relied on the ability of the government but forgot that it was an era of self-help and survival of the fittest. The educational level of these fishermen was mostly elementary or junior high schools (78.2%). Regarding this, it is necessary to reeducate these fishermen and promote MPAs to them. Most of the staff of fishermen's associations and experts and scholars believed that having fishermen and the government co-manage the MPA is the best method. Co-management allows the government to take advantages of fishermen's experience in planning core, buffer, and transition zones for MPA. Moreover, these zones can be further categorized into whales and dolphins protection zones, general fishery zones, core protection zones, etc. Utilizing local talents and co-managing with fishermen who know the oceans the best can help save manpower and resources; furthermore, it can raise local residents' awareness in environmental protection (Fig. 4).

4. MPA Co-management

Co-management is a better and more effective method of managing MPA. It allows stakeholders to participate in preparation and maintenance works. This study referred to the co-management pattern proposed by Chuang [6], which is shown in Fig. 5.

The process starts with the centralized management system. After the requirements of the MPA system is defined, the government begins to collect information and consult experts from the industrial, official, and academic communities for

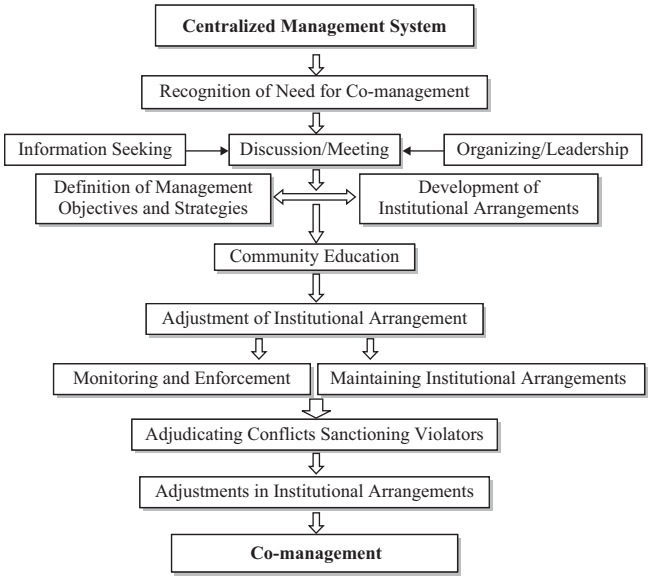

Fig. 5. The Concept of Co-management for MPA.

possible drawbacks in the existing system which need improvement. After continuous communications and understanding of local cultures, economies, natural conditions, ecological systems, and environments, the government unites public authorities, local organizations, fishermen, and experts to form a team. The purpose of this team is to work out management goals, strategies, and systems together. Along the process, the management becomes more complete through the integration of opinions and experiences of stakeholders. In addition, mediators are sent to communities to promote conservation concepts and continue the efforts of resolving conflicts among stakeholders. Lastly, a supervision and maintenance system is developed, which leads to the formation of the most appropriate MPA co-management system.

VI. CONCLUSION

There was a pattern of misinformation existing among fishermen. Most of them believed MPAs consisted single-facet plan, and only few were aware that MPAs could be zoned for management. After interviews and communications, it was generally observed that the fishermen did not oppose the establishment of MPA in Gueishan Island. This is in support to the findings that well-informed fishermen's recognition is the key to the success of MPA. Information regarding fishermen's lack of awareness and confidence about co-management, means that more promotions, communications, and education are needed to forge a consensus on marine conservation.

The stakeholders held a positive attitude towards MPAs, and most of them supported the conservation and restoration of marine biological resources. Nevertheless, the establishment of MPA should give considerations to fishermen's financial status, compensation mechanism, the exertion of

government power, and strict implementation of the program. As for the compensation and supporting measures, the government can offer second-skill training programs, assist fishermen in starting other careers, and provide subsidies during fishing closure. In reality, the funds saved from the reduction of oil subsidies can be used as conservation funds. Moreover, old fishing boats and fishing equipments which may damage the environment can be purchased by the government. As for legal basis of MPAs, the respondents believed that no matter which law is applied, implementing the regulations thoroughly is the key point. It is suggested that MPA can be established based on Article 5 of the Enforcement Rules of the Wildlife Conservation Act to protect biodiversities.

Finally, based on this study, the keys to the success of MPA are: (1) communication and education of the necessity of marine conservation; (2) the establishment of MPA should give considerations to fishermen's financial status (family livelihood, job transfer); (3) a valid compensation mechanism; (4) effective governance, and (5) strict implementation of the program.

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