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Institutional arrangements for the management of marine protected areas in Taiwan

Chi-Ming Wang [a], Li-Shu Chen [b], Kuo-Huan Ting [a], Kun-Lung Lin [a], Hao-Tang Jhan [c], Jau-Yu Chen [a], Wen-Hong Liu [a, d, *]

[a] Department of Fisheries Production and Management, National Kaohsiung Marine University, Taiwan, ROC
[b] National Museum of Marine Science and Technology, Taiwan, ROC
[c] School of Earth and Ocean Science, Cardiff University, UK
[d] Master Program of Marine Affairs and Business Management, National Kaohsiung Marine University, Taiwan, ROC

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ABSTRACT

With the growth of population and rapid development of economy in Taiwan, problems including the reduced number of marine habitats and increased sea pollution have continued to harm marine bio-resources and diversity. Although the Taiwanese government has established several kind of marine protected areas (MPAs) but the management performance is dissatisfactory. Therefore, the management arrangements of MPAs in Taiwan are discussed in this study, based on 3 institutional arrangement elements: governmental organization, legal basis, and non-governmental organizations (NGOs). A questionnaire survey was administered to 4 groups (industrial, governmental, scholar, and NGO) to understand how these groups perceive the institutional arrangements of the management of MPAs in Taiwan. Finally, the institutional arrangements of the management of the MPAs discussed. The research findings showed that most survey participants believed that governmental organizations most required improvement, particularly in "monitoring standard" and "financial budget allotment." Other than "stability," the participants disapproved of the legal basis in the institutional arrangements of the management of MPAs. Among the 4 participating groups, only NGOs agreed that NGOs should be involved in the institutional arrangements of the management for MPAs in Taiwan. All 4 groups approved the institutional arrangements regarding "participation and cooperation," and none of the 4 groups approved the institutional arrangements regarding "more responsible behavior."

1. Introduction

Marine protected areas (MPAs) have been generally accepted by people as one of effective method to protect biodiversity and fishery resources (Hilborn et al., 2004; Shao, March 2013; Liu, 2011a). Countries worldwide have been advised to assign 20%–30% of marine habitats as no-take zones (CBD (Convention on Biological Diversity), 2004; Ojeda-Martinez et al., 2009) and to complete the establishment of the MPA network and database. Thus, countries began to establish MPAs and the number of MPAs continued to increase (Kelleher et al., 1995). In the last two decades, the global area of MPAs has increased at an annual rate of 5.2%, which is approximately 2.2 million km^2 and 0.6% of the entire ocean (Wood et al., 2007).

In order to preserve biodiversity, the Taiwanese government has established various types of MPAs on the basis of various laws for decades (Shao, 2003). A total of 123 MPAs have been established, covering an area of 18 974 km^2. However, 14 674 km^2 of the coastal protected areas are not governed by laws (Table 1) (Shao and Lai, 2011). Despite the existence of multiple protected areas in Taiwanese waters, coral reefs, wetlands, and lagoons are still under the threat of damage and pollution because of a lack of practical management and law enforcement. Therefore, marine biodiversity continues to decline in Taiwan (Chiau, 2004; Hsien et al., 2004; Taiwanese Coral Reef Society, 2005). Thus, the *Ocean Policy White Paper* was published to preserve marine biodiversity and aim for resource sustainability in 2006, describing MPAs as a critical policy (Council of Marine Affairs Advancement, 2006; Chang et al., 2012). The Biodiversity Action Plan is conducted and proposed by the

* Corresponding author. Department of Fisheries Production and Management, National Kaohsiung Marine University, No.142, Haijhuan Rd., Nanzih District, Kaohsiung City 81143, Taiwan, ROC. Tel.: +886 7 3617141x3514; fax: +886 7 3642297.
E-mail address: andersonliu@mail.nkmu.edu.tw (W.-H. Liu).

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Table 1
Types of MPA in Taiwan.

Type	Name	Area (ha)	Protected target	Administration authority
National park	Kenting National Park	32 631 in total 17 731 (land) 14 900 (ocean)	Marine ecology, uplifted coral reefs, coastal forests, and waterbirds	Construction and Planning Agency, Ministry of the Interior
	Dongsha Marine National Park	353,667.95 in total 174 (land) 353,493.9 (ocean)	The Dongsha atoll is a complete coral reef that has a unique marine ecology and high biodiversity. It is a crucial habitat for marine resources for the South China Sea and oceans near Taiwan.	Construction and Planning Agency, Ministry of the Interior
	Taijiang National Park	39 310 in total 4 905 (land) 34 405 (ocean)	Natural wetland ecology, critical culture in the Taijiang area, history, ecological resources, Taiwan Strait, and ancient channels	Construction and Planning Agency, Ministry of the Interior
Nature reserve	Kenting Uplifted Coral Reef Nature Reserve	137.625	Uplifted coral reef	Forestry Bureau, Council of Agriculture, Executive Yuan
	Guandu Nature Reserve	55	Sea birds and wetland ecosystem	Taipei City Government
	Penghu Columnar Basalt Nature Reserve	19.13 (high tide) 30.87 (low tide)	Columnar basalt	Penghu County Government
	Danshui Mangrove Nature Reserve	76.41	Mangrove	Forestry Bureau, Council of Agriculture, Executive Yuan
	Wazihwei Nature Reserve	30	Mangrove	New Taipei City Government
	Wushihbi Coastal Nature Reserve	347	Coastal forests and scenery	Forestry Bureau, Council of Agriculture, Executive Yuan
Wildlife Reserve	Wuweigang Waterbird Refuge	101.6194	Waterbirds and their habitats	Yilan County Government
	Lanyang Estuary Waterbird Refuge	206	Estuary and coastal ecosystem, waterbirds, and other wildlife	Yilan County Government
	Mianhua and Huaping Islets Wildlife Refuge	222.3824	Island ecosystem, waterbirds, wildlife, and volcanic landforms	Keelung City Government
	Penghu County Cat Islets Seabird Refuge	36.2042	Terns and their habitats	Penghu County Government
	Penghu County Wangan Island Green Turtle Breeding Refuge	23.3283	Green turtles and their breeding areas	Penghu County Government
	Tainan City Sihcao Wildlife Refuge	515.1	Wetlands and waterbirds	Tainan City Government
	Taipei Anatidae ducks Refuge	245	Anatidae ducks and other creatures	Taipei City Government
	Dadu Estuary Major Wildlife Habitat	2 669.73	Waterbirds and estuary and coastal ecosystems	Taichung County Government
	Matsu Islands Tern Refuge	71.6166	Waterbirds and the island ecosystem	Lienchiang County
National scenic area	Penghu National Scenic Area	85 603 in total 10 873 (land) 74 730 (ocean)	Coastal scenery and marine ecology	Tourism Bureau, Ministry of Transportation and Communications
	East Coast National Scenic Area	41 843	Coastal scenery and marine ecology	Tourism Bureau, Ministry of Transportation and Communications
	Northeast and Yilan Coast National Scenic Area	17 421	Coastal scenery and marine ecology	Tourism Bureau, Ministry of Transportation and Communications
	Dapeng Bay National Scenic Area	2 764	Lagoon ecosystem and coastal tourism	Tourism Bureau, Ministry of Transportation and Communications
	North Coast and Guanyinshan National Scenic Area	10 496 in total 6 085 (land) 4 411 (ocean)	Coastal scenery and marine ecology	Tourism Bureau, Ministry of Transportation and Communications
	Southwest Coast National Scenic Area	84 049 in total 33 413 (land) 50 636 (ocean)	Coastal scenery and marine ecology	Tourism Bureau, Ministry of Transportation and Communications
	Matsu National Scenic Area	25 052 in total 2 952 (land) 22 100 (ocean)	Coastal scenery and marine ecology	Tourism Bureau, Ministry of Transportation and Communications
Fishery conservation zone	25 in total	4 795	Aquatic animals or plants	Fisheries Agency, Council of Agriculture, Executive Yuan
Artificial reef	69 in total	2.37	Artificial reefs	Executive Yuan Council of Agriculture Fisheries Agency or city and county governments
Coastal protected area	12 in total	235 809	Coastal scenery and marine ecology	Ministry of the Interior

National Council for Sustainable Development, Executive Yuan to organize practical operating and to establish performance indicators specifically regarding MPAs. Before 2020, 20% of the sea areas within the territorial sea are planned to be assigned as MPAs in Taiwan, and management programs are implemented accordingly (Council of Marine Affairs Advancement, 2006).

The most crucial aspect in the process of policy development is to create effective institutional arrangements that ensure MPAs can produce the expected effects. Otherwise, a great amount of MPAs may serve only as non-functional decorations that do not achieve marine biodiversity protection or fishery resource restoration. Institutional arrangements are not concerned only with political