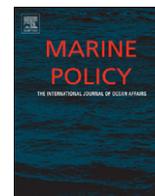




ELSEVIER

Contents lists available at ScienceDirect

## Marine Policy

journal homepage: [www.elsevier.com/locate/marpol](http://www.elsevier.com/locate/marpol)

# Marine protected areas in Japan: Institutional background and management framework

Nobuyuki Yagi, Akira P. Takagi\*, Yukiko Takada, Hisashi Kurokura

Graduate School of Agricultural and Life Sciences, The University of Tokyo, 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657, Japan

## ARTICLE INFO

### Article history:

Received 13 May 2010

Accepted 5 June 2010

### Keywords:

Co-management

Fisheries co-operative association

Marine protected area

No-take zone

## ABSTRACT

Information on the location and area for all MPAs in Japan was collected through a comprehensive survey targeting government officials and local stakeholders. It was verified that at least 1161 MPAs exist in Japan. Of these, 1055 are implemented in conjunction with fishery regulations in the form of no-take zones. More than 30% of the individual MPAs in Japan were established by self-imposed instruments agreed by members of fishery co-management organizations. It was suggested that the autonomous MPAs are not a product of simple altruism, but rather are logical extensions of the tenure system guaranteed by the government legal system.

© 2010 Elsevier Ltd. All rights reserved.

## 1. Introduction

Marine protected areas (MPAs) are gaining increased attention in the world. In 2002, the world summit on sustainable development (WSSD) called for establishing a global system of MPA networks by 2012 [1]. This resolution was reaffirmed at the conference of the parties (COP) to the convention on biological diversity (CBD) and other international meetings.

In Japan, however, no complete database of domestic MPAs has been established. One impediment for this work is the absence of common views on what does or does not constitute an MPA in Japanese waters. International Union of the Conservation of Nature (IUCN) defined MPA as “any area of intertidal or subtidal terrain, together with its overlaying waters, and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment [2]”. The COP7 of the CBD noted that “‘Marine and Coastal Protected Area’ means any confined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoy/enjoys a higher level of protection than its surroundings [3].”

If these definitions are applied to Japan, relatively large areas of coastal waters would be considered potential MPAs. The marine areas from the shoreline to several miles off the coast around Japan are covered by a tenure zone in which strict limited

entry for commercial fisheries have been instituted based on territorial use-rights (fishery rights). Biodiversity in the tenure area can enjoy a higher level of protection than its surroundings because more intense management and enforcement practices for fishing activities are generally in place. In addition, coastal developers are usually barred from reclamation, mining, or coastal construction activities unless they pay considerable compensation to fishers as mitigation for affecting local fishery rights. If the objective of a study is to calculate the maximum area coverage of MPAs in Japan, one might take the position that the tenure area is a large MPA.

The focus of this study, however, is to discuss the institutional characteristics and socio-economic background of various spatial and temporal measures that result in numerous no-take zones in Japan. A complete picture of these areas has yet to be established due to difficulties gathering information. Some of the no-take zones are established by informal agreements among the members within a co-management organization of local fishers, and only fragmented information is available until now.

A previous publication attempted to estimate the total area of MPAs in Japan [4]; however, it only described MPAs established by law and protected throughout the year. Consequently, voluntary, or seasonal MPAs were excluded from the scope of the previous study. Although some seasonal and autonomous MPAs are studied in other literature [5,6], their focus was placed on in-depth analysis of several selected locations but not on the horizontal examination of MPAs in Japan in general.

In this study, information on all possible MPAs in Japan were collected regardless of their legal status or seasonal coverage. Effectiveness of each potential MPA is reviewed using available information in an effort to establish a more comprehensive picture of the MPAs in Japan.

\* Corresponding author. Tel./fax: +81 3 5841 5018.

E-mail address: [akirapt@mail.ecc.u-tokyo.ac.jp](mailto:akirapt@mail.ecc.u-tokyo.ac.jp) (A.P. Takagi).

## 2. Materials and methods

For the purpose of this study, information on the current status of the following six types of potential MPAs were collected through oral and written communications with relevant management authorities in Japan from November 2009 to April 2010.

The six types of potential MPAs are marine park areas established by the natural parks law (hereinafter, referred to as type I MPAs), marine special areas established by the nature conservation law (type II MPAs), special protected zones inside the wildlife special protection areas, which are established by the wildlife protection and appropriate hunting law (type III MPAs), protected waters established by the act on the protection of fishery resources (type IV MPAs), legally binding no-take zones of aquatic animals and plants established under the fishery act and prefectural fishery coordinating regulations (type V MPAs), and no-take zones established through self-imposed agreements among the members of the fishery co-operative associations (FCAs) (type VI MPAs).

The MPAs under types I, II, and III are managed by the Ministry of the Environment of Japan. The authors visited the Ministry to obtain necessary information. Supplemental information was collected from prefectural governments. Likewise, information about MPAs under types IV and V was acquired through the offices of the fisheries agency of the ministry of agriculture, forestry, and fisheries of Japan, as well as prefectural governments. The authors also used the dataset of binding regulations imposed by 39 prefectural governments, which were compiled by the national federation of fisheries co-operative associations in March 2009 as contract work for the fisheries agency. There are 47 prefectural governments in Japan and 8 prefectures have no access to the sea. The remaining 39 prefectures cover all the ocean coasts of Japan and, therefore, this dataset covers all coastal areas in Japan.

Information on MPAs under type VI was gathered from officials in the relevant prefectural governments. Although the primary information on these MPAs are held by local FCAs, the number of FCAs exceeds 1000 in Japan and low recovery rate of necessary information was expected. To maximize the rate of return, a questionnaire was sent to officials at the 39 prefectural governments via the national government (i.e., the fisheries agency of Japan).

Officials in prefectural governments are usually in a better position to obtain accurate information on the most recent activities of the FCAs located in their region. They were asked if the FCAs established a no-take zone as a self-imposed rule of the FCA. If that was the case, data submission was requested with respect to the location, duration, areas (hectare) of such no-take zones, as well as the name of species to be protected and the name of FCAs responsible for managing such zones. The questionnaires specifically asked that the answer should exclude the no-take zones specified by the prefectural fishery coordinating regulations (i.e., types IV and V MPAs) to avoid double counting. Examinations were made to judge the nature of the protections for each type of MPA to determine if they actually fall into the MPA concepts defined by the CBD and IUCN.

## 3. Results

### 3.1. Marine park areas (type I MPAs)

A total of 82 marine park areas were identified as of April 1, 2010. Of these, 51 areas (2675.5 ha in total) were established inside the national parks and 31 areas (1385.4 ha) were inside the quasi-national parks (Table 1). Information on the size of each area (hectare) is available for all the 82 areas. The largest one is 311.6 ha and the smallest one is 2.0 ha. These locations are protected year round.

**Table 1**

The number of MPAs in each prefecture in Japan.

MPA type	I	II	III	IV	V	VI	SUM
Hokkaido	2	–	6	–	117	9	134
Aomori	2	–	–	4	13	8	27
Iwate	–	–	–	–	46	32	78
Miyagi	1	–	2	–	16	18	37
Akita	–	–	–	–	20	12	32
Yamagata	–	–	–	–	12	5	17
Fukushima	–	–	–	1	17	4	22
Ibaraki	–	–	–	3	6	1	10
Chiba	1	–	1	–	6	19	27
Tokyo	15	–	–	–	11	28	54
Kanagawa	–	–	2	–	2	1	5
Niigata	3	–	–	–	12	3	18
Toyama	–	–	–	–	11	3	14
Ishikawa	2	–	–	–	8	12	22
Fukui	1	–	1	–	7	1	10
Shizuoka	–	–	–	2	20	2	24
Aichi	–	–	1	2	11	14	28
Mie	1	–	1	–	5	36	43
Kyoto	1	–	–	–	4	7	12
Osaka	–	–	–	–	5	–	5
Hyogo	3	–	1	3	14	5	26
Wakayama	1	–	1	–	2	13	17
Tottori	1	–	–	–	11	9	21
Shimane	5	–	2	–	6	9	22
Okayama	–	–	–	3	21	–	24
Hiroshima	–	–	1	2	90	1	94
Yamaguchi	1	–	–	6	6	3	16
Tokushima	2	–	–	–	2	7	11
Kagawa	–	–	–	3	33	–	36
Ehime	1	–	–	1	2	–	4
Kochi	5	–	–	–	9	8	22
Fukuoka	–	–	–	2	4	4	10
Saga	1	–	–	–	4	13	18
Nagasaki	7	–	–	–	8	10	25
Kumamoto	3	–	–	5	24	3	35
Oita	1	–	–	11	12	6	30
Miyazaki	2	–	–	2	11	53	68
Kagoshima	9	–	1	–	6	24	40
Okinawa	11	1	3	2	2	4	23
SUM	82	1	23	52	616	387	1161

The purpose of the natural parks law is “the protection of the places of national scenic beauty and also, through the promoted utilization thereof, at the contribution to the health, recreation and culture of the people and ensuring the conservation of biodiversity” (Article 1). With respect to the protection of marine biodiversity, the law prohibits certain activities inside the marine park areas unless the governments issue permission. Such activities include “capturing, killing or wounding, gathering, or damaging ornamental fish, coral, seaweed, or plants and animal life similar to them that has been designated for each national and quasi-national park by the minister of the environment with the consent of the minister of the agriculture, forestry and fisheries (subparagraph 2 of paragraph 3, Article 22)” or “discharging polluted or waste water through the sewage disposal facilities (subparagraph 6)”. Enforcement status of such regulations are closely monitored and supervised by rangers for nature conservation (government officials) stationed in the region and local contract agents.

### 3.2. Marine special areas (type II MPAs)

One marine special area was identified as of April 1, 2010. It is located in Sakiyama bay in Okinawa and has the area of 128 ha (Table 1). The area is protected year round. The purpose of the nature conservation law is to allow people to enjoy the benefits of the natural environment and to carry over such benefits to future generations, thus ensuring a healthy and culturally rich life for the

people in present and in the future through overall promotion of the proper conservation of biodiversity and the natural environment in the areas where special needs exist to conserve the natural environment (Article 1). Regarding the protection of marine biodiversity, the law prohibits certain activities inside the marine special areas unless the minister of the environment issues the permission. Such activities include “capturing, killing or wounding, gathering, or damaging ornamental fish, coral, seaweed, or other plants and animal life that has been designated by the minister of the environment with the consent of the minister of the agriculture, forestry, and fisheries (subparagraph 5 of paragraph 3, Article 27)” or “mining minerals or removing soil or gravel (subparagraph 3).” Enforcement status of such regulations are closely monitored and supervised by rangers for nature conservation (government officials) stationed in the region and local contract agents.

### 3.3. Special protected zones inside the wildlife protection areas (type III MPAs)

While a majority of special protected zones only cover land areas, the authors identified 14 zones, which also include marine areas using a database registered in the ministry of the environment as of March 2010. The total marine coverage is 30,539 ha for the special protected zones designated by the minister of the environment. The largest zone is 7645 ha and the smallest is 12 ha, with an average size of 2181.4 ha per zone. Protection is year round for all locations.

It was also confirmed that additional 9 zones were designated by prefectural governors. The total marine coverage is 10,225.8 ha for these special protected zones, with the largest zone being 6230 ha, the smallest zone being 1 ha, and an average size 1136.2 ha per zone. These areas are protected year round.

The wildlife protection and appropriate hunting law, through the protection of wildlife and properly controlled hunting, aim at ensuring biodiversity, conserving living environments for the people, and facilitating the sound development of agriculture, forestry and fishery (Article 1). The law generally prohibits hunting and taking of wild birds and mammals (Article 8), including sea birds and several marine mammals such as dugong and certain pinniped species (Article 78 of the implementation rule of the wildlife protection and appropriate hunting law). The law also stipulates that the minister of the environment or each prefectural governor, if necessary, may establish wildlife protection areas (paragraph 1 of Article 28). Any owners of private properties located inside the wildlife protection areas shall, in principle, accept the installment of facilities necessary for the survival of wild mammals and birds when such installment is proposed by the minister of the environment or the prefectural governor (paragraph 11 of Article 28).

The minister of the environment or each prefectural governor, if necessary, may designate special protected zones inside the wildlife protection areas (paragraph 1 of Article 29 of the law). Inside the special protected zones, it is prohibited to construct buildings or other structures, to reclaim the sea, to log trees or engage in other activities specified by government ordinances (paragraph 7 of Article 29). Enforcement status of such regulations are closely monitored and supervised by rangers for nature conservation (government officials) stationed in the region and local contract agents.

### 3.4. Protected waters (type IV MPAs)

There are a total of 52 protected waters covering the marine environment in Japan (Table 1). Information on the size of each

area (hectare) is available for all the 52 marine protected waters. The largest one is 275 ha and the smallest one is 7 ha with the average 57 ha. The season of protection is year round for all the locations.

The purpose of the act on the protection of fisheries resources is to ensure the protection and enhancement of fishery resources, to maintain their benefits for the future, and thereby to contribute to the development of these fisheries.

Article 14 of the act defines the term protected water as a water area “where aquatic animals lay eggs, juvenile fish grow or where it is appropriate for seeds and seedlings of aquatic animals and plants to generate and is designated by a prefectural governor or the minister of agriculture, forestry and fisheries” for the purpose of protection and enhancement of the aquatic species. The governor or the Minister shall establish a management plan for a protected water, which includes details of restrictions or prohibition on the take of aquatic species (Article 17). Inside the protected water, reclamation, dredging, and construction works, which change the water level of rivers or which seriously influence the management plan, shall be prohibited in principle (Article 18).

All the areas of protected waters are listed in the prefectural fishery coordinating regulations. The regulations are imposed by the Japanese coast guard and fishery inspectors of the national and prefectural governments using patrolling vessels or other means. Any offence against the rule is subject to prosecution.

### 3.5. Legally binding no-take zones (type V MPAs)

There are a total of 616 legally binding no-take zones that were identified from the prefectural fishery coordinating regulations of the 39 prefectural governments. The locations of no-take zones are specified in the regulations enacted by the prefectural governments. While they specify the exact location of the no-take zones, information on the size of each area (hectare) is not readily available from the texts of the regulations.

Two hundred and sixty six no-take zones are year round regulations, while 350 are established on a seasonal basis. Duration of the seasonal closures vary; with most falling in the range of 3–9 months in length. Closed seasons are usually chosen to cover the migrating or spawning seasons of species subject to protection. In some no-take zones, all the aquatic plants and animals are protected. In other cases only a limited number of species are specified for protection.

The aim of prefectural fishery coordinating regulations is to provide detailed regulations on protection and enhancement of fishery resources as well as monitoring, control, and surveillance of local fishery operations, which are necessary to implement the act on the protection of fisheries resources and the fishery act. The regulations are enforced by fishery inspectors of the national and prefectural governments as well as the coast guard, which uses patrol vessels or other means. Any offence is subject to prosecution.

### 3.6. Self-imposed no-take zones of FCAs (type VI MPAs)

Prefectural governments collect information from FCAs in their regions. All of the 39 coastal prefectures, to which questionnaires were sent, returned their answers before the end of April 2010. Based on the results, a total of 387 self-imposed no-take zones were identified. Most of the locations of these no-take zones were specified in the answers except for some cases. For instance, one prefecture responded that the local FCAs did not consent to disclose the exact location of no-take zones because such information, if made available to the public, might induce

poachers from outside of their local communities. Information on the size of each area (hectare) is available for 69 autonomous no-take zones. Among them, the largest area is 62,500 ha and the smallest one is 0.03 ha, with an average size of 1745 ha.

One hundred and thirty seven no-take zones are protected throughout the year, while 250 are established on a seasonal basis. The duration of the seasonal closures varies, ranging from 1 to 11 months. In some cases, fishing activities are prohibited almost year round except for several days. In other cases, closed seasons are relatively short and only covering the migrating or spawning seasons of commercially important species.

All of these areas are not directly protected by national laws, ministerial ordinances, or prefectural fishery coordinating regulations. Nonetheless, it was noted through interviewing with officials in prefectural governments that good compliance was maintained for such self-imposed no-take zones (institutional characteristics behind such good compliance will be discussed in the later section).

## 4. Conclusions

### 4.1. The total number and area coverage of MPAs in Japan

Our survey identified at least 1161 candidates for MPAs in Japan (Table 1). They are more or less evenly distributed throughout the Japanese coast (Fig. 1). While protections are provided through various legal backgrounds and management frameworks, these areas are intended for the protection of specific elements of marine environment (Table 2). Their regulations are closely monitored and enforced by coast guards, fishery inspectors, rangers for nature conservation, and other entities. It is considered that biodiversity in these areas afforded a higher level of protection than its surroundings and they fall into the MPAs as defined by IUCN or CBD.

Of the 1161 areas above, 1055 locations are implemented in conjunction with fishery regulations and they take the form of no-

take zones in fishery operations. The relevance of the number of no-take zones, identified through this study, can be explained by the management system of fisheries in Japan. Most of the target species have been managed using input controls, while seven fish species (34% of national landing volume as of 2007) are subject to output control regulation under the total allowable catch (TAC) system since 1997. Input control methods involve limitations on vessel tonnage, horse power, gear, seasons, and areas of operation. The local FCAs play a critical role in the implementation of such rules. The number of the FCAs in Japan was 1092 as of March 31, 2009, according to the fisheries agency. Our survey found that many FCAs owned one no-take zone, while other FCAs had two or more and still other possessed none. The number of the no-take zones is reasonable, judging from the fact that it roughly corresponds to the number of FCAs, which is a local co-management unit of coastal fisheries in Japan.

Information on the name of species subject for the protection is available for 599 locations out of the above 1055 no-take zones. Majority of them listed specific name of marine species as their protection targets, while some of them protect "marine species in general". We have identified the name of 142 species from the text of prefectural fishery coordinating regulations and the answer sheets returned from the officials of prefectural governments. They are 54 finfish species, 36 shellfish species, 24 aquatic plant species, and 28 other species such as invertebrates.

The average size of individual MPAs ranged from 100 to 2000 ha in this study. The size of Japanese MPA tends to be small because majority of them are community-based protected areas. It should be noted that this size is consistent with MPAs in other part of the world. Based on experience with existing MPAs in northwestern Mediterranean, an area of between 200 and 2000 ha may be a satisfactory compromise [7]. It was pointed out that most successful MPAs tend to be small, community-based, and fisheries-focused [8].

The total area of MPAs in Japan was not calculated in this study. Information on the possible overlaps between different types of MPAs, as well as the exact size of some areas in types V and VI MPAs, are missing and this makes an accurate calculation on the total coverage difficult at this stage.

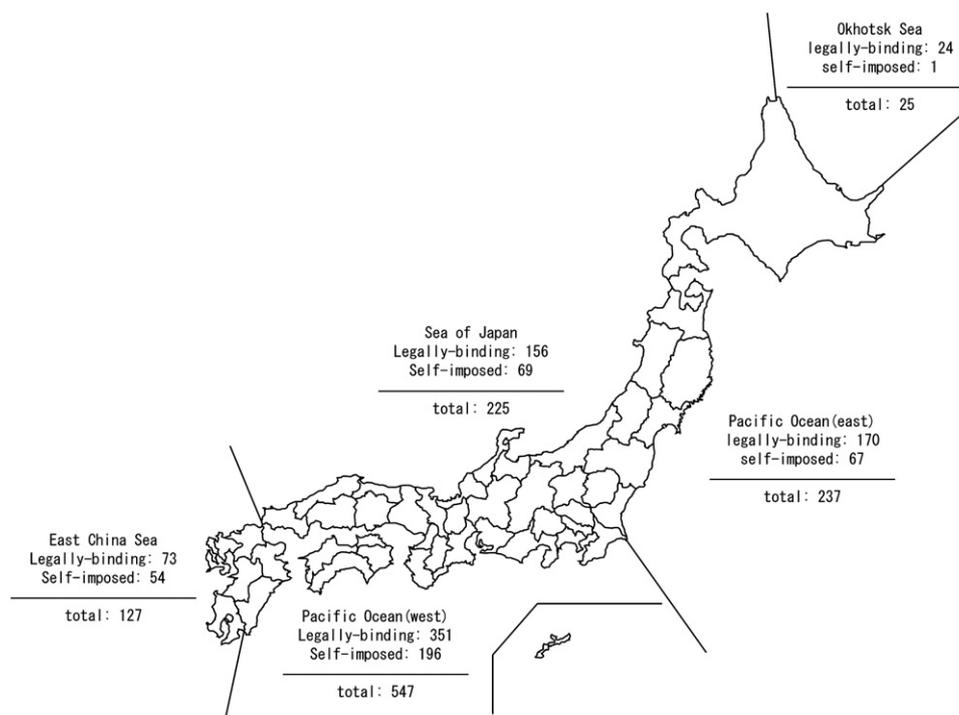


Fig. 1. Geographical distributions of MPAs in Japan.

**Table 2**  
Institutional background and management framework of MPAs in Japan.

MPA type	Management authorities	Governing legal instruments	Purpose	Prohibited activities
Marine park areas (type I)	Ministry of the environment; prefectural governments	Natural parks law	Protection of scenic beauty; conservation of biodiversity	Capturing aquatic plants and animals designated by governments; water pollution or sewage disposal.
Marine special areas (type II)	Ministry of the environment; prefectural governments	Nature conservation law	Conservation of biodiversity and the natural environment	Capturing aquatic plants and animals designated by governments; mining minerals or removing gravels
Special protected zones in wildlife protection areas (type III)	Ministry of the environment; prefectural governments	Wildlife protection and appropriate hunting law	Protection of wildlife; control on hunting; biodiversity conservation; sound development of agriculture, forestry, fisheries.	Hunting and taking of sea birds and certain marine mammals; reclamation; tree logging.
Protected waters (type IV)	Ministry of agriculture, forestry, and fisheries; prefectural governments	Act on the protection of fisheries resources	Protection and enhancement of fishery resources; development of fisheries.	Restriction or prohibition on the take of aquatic species; land reclamations; dredging, construction works.
Legally binding no-take zones (type V)	Ministry of agriculture, forestry, and fisheries; prefectural governments	Prefectural fishery coordinating regulations	Protection and enhancement of fishery resources; monitoring and control of local fisheries.	Fishery harvest of certain species; or all fishing activities.
Community-based self-imposed no-take zones (type VI)	Local fisheries co-operative association (FCA) with peer-monitoring mechanism	Formal (published) or informal (unpublished) agreements of FCA members	Protection and enhancement of fishery resources; control of local fisheries.	Fishery harvest of certain species; or all fishing activities.

#### 4.2. Governance mechanisms behind self-imposed MPAs in Japan

It was found that more than 30% of the individual MPAs in Japan were established by non-binding instruments such as voluntary agreements among fishers of FCAs. A question may arise on status of enforcement for self-imposed areas, although officials in prefectural governments generally assume high compliance rates for self-imposed no-take zones. The tendency of such good compliances can be explained by the following governance mechanisms.

First, self-imposed no-take zones have certain economic relevance to implement peer monitoring among the members in the same FCAs. Because the limited entry system in coastal fisheries is strictly maintained by the fishery right regime imposed by the government, the same group of persons who belong to a same FCA assume long-standing rights to collectively use fishery resources in their waters. In other words, the same group of fishermen bears the cost of conservation and receives the benefits inside their local waters. Once they mutually agree to create a no-take zone as a mean to maximize their collective benefit, they have a strong incentive to adhere to it and peer-monitoring activities would be initiated to deter poachers. Several fishermen informed the authors that they in fact monitor positions of boats of their peers in the sea using vessel positioning devices, cell-phones, or other communication tools. Sanctions among co-operative members and the local societies are often levied in the case of infringement.

Second, self-imposed no-take zones are perceived as being just as legally binding as other no-take zones among FCA members. The majority of legally binding no-take zones and protected waters listed in prefectural fishery coordinating regulations are considered to be originated from historic voluntary no-take zones in the past. Community-based coastal fisheries management started more than 250 years ago in Japan [9]. The record shows that the fishery regulation of Tokushima prefecture, for instance, which was enacted in 1895, contained provisions of closed areas and seasons. Such provisions were not a new creation at the time of the legislation about 115 years ago but merely a legalization of measures that already existed as self-imposed community rules [10]. This observation is reasonable judging from the fact that a new creation of no-take zones from the scratch usually requires more transaction cost than just reauthorizing already existing

customary rules. It can be argued that, because starting points of voluntary and legally binding no-take zones were similar, the members in FCAs tend to adhere to both rules in similar manners.

The reason why some of them are left unlisted in the government legal frameworks can be explained as follows: first, the non-binding ones are relatively new and therefore missed the timing of major revisions of prefectural fishery coordinating regulations. Members of FCAs would prefer to avoid the rigorous documentation process required to register such areas as legally authorized protected areas, when good compliance for such local MPAs are maintained even without the formal legal status. Second, fishers prefer flexibility in protecting migratory species. In the case of the sand eel fishery in Ise bay, the area of autonomous MPA changes weekly to allow timely escapement of moving fish stocks [5]. If the regulation is legalized, it would not be fully adaptive to the rapidly changing distributions of target species of the protection.

#### 4.3. Potential MPA candidates but excluded from this study

A number of legitimate candidates for MPAs are excluded from Tables 1 and 2 of this study. First, the tenure zone covered by the fishery right is not listed, although it is a legitimate candidate for MPAs in Japan.

Second, underreporting is likely on the location of the type VI MPAs. The author noticed that several known no-take zones were missing from the report submitted by prefectural governments. Upon our inquiry, one official in a prefectural government noted that underreporting might happen when FCAs considered that their protected area was too small to report to the government. The magnitude of such underreporting is unknown.

Third, the natural monuments established by the act on protection of cultural properties were also excluded from the list in Tables 1 and 2. Although some of the natural monuments cover the marine areas and they provide protections for some marine species, no special MCS (monitoring, control, and surveillance) mechanism designed for the enforcement of such provision are recognized [4]. Consequently, the authors decided not to include the natural monuments in this particular study.

Lastly, activities for habitat rehabilitation are not counted in this study, although the report of many of such activities are

available through various publications and websites (<http://hitoumi.jp/hozen/> for instance). They include sea-grass planting, sediment removal from the ocean bottom, removal of alien species, or tree planting adjacent to upland rivers to improve the water quality entering the ocean. Some of them are conducted to address the externalities such as land-based pollutions. Modifications of river structures such as dams are ongoing in some areas to facilitate the interactions between marine and terrestrial ecosystems [6]. More than 90% of the fishing communities in Japan were engaged in beach clean-ups in 2003 [11].

Although these activities are excluded from the scope of this study, the benefit of these activities should be evaluated in a future study. To this end, performance indicators of MPAs, other than total area coverage, should be duly developed and agreed by the international community. This would benefit the fair and holistic evaluation of marine conservation activities, in particular, those addressing problems originated from externalities of coastal communities or rehabilitation of ecosystems. This would also contribute to altering the current excessive attention to the area coverage of MPAs.

#### 4.4. Institutional characteristics and the future of MPAs in Japan

Japan has employed both bottom-up and top-down management approaches in establishing MPAs. The MPA categories managed by the fisheries agency, MAFF, are originated from bottom-up movements of coastal stakeholders. They do not necessarily, however, provide ample protections against their externalities such as land-based pollution or coastal reclamation. On the contrary, MPAs managed by the ministry of the environment are based on the top-down regulations initiated from the government. While addressing the problems of externalities, they do not usually provide general prohibition of fishing in the area since the protections are, in principle, only extended to limited species of aquatic plants and animals designated by the government.

Increased coordination efforts should be desirable between the two separate management authorities to increase networks of the MPAs under the two separate approaches. The headquarter for ocean policy, which was newly established in the cabinet of Japan after the enactment of the Ocean basic law in 2007, is expected to play this role.

It would be unnecessary, however, for the headquarter to integrate Japanese MPAs into one single regulation. No tangible problems on the coherence of these two approaches are recognized during the research process in this study. History revealed that sudden changes or replacement of institutional frameworks were not always successful for the management of coastal fisheries in Japan [12]. Ostrom [13] also argued that public policies based on notions that all common pool resource appropriators are helpless and must have rules imposed on them can destroy institutional capital that has been accumulated during years of experience in particular locations. Any fundamental changes that alter the existing governance mechanism should be fully discussed with stakeholders beforehand.

#### 4.5. Implications for the progress of the discussion of MPAs in the global scale

It can be argued that the Japanese style self-imposed MPAs would be difficult to transfer to some other countries unless they have a similar tenure system based on strong territorial use-rights guaranteed by the governments. Obviously, users must be interested in the sustainability of the particular resource so that the expected benefits will outweigh current costs [14]. To this end, the role of the government is important in keeping the non-

stakeholders from gaining access to no-take zones [8]. In the case of Japan, the fishery right issued by the government allows exclusive access to fishery resources for the license holder, and is treated as a non-transferrable property right under the fishery act. In return, FCAs are expected to establish their collective management rules for resource exploitation in the tenure area [9]. Self-imposed MPAs are one of the management tools, which could bring joint benefit to the members of the co-management group. In sum, the autonomous MPAs are not a product of simple altruism, but rather are logical extensions of the tenure system guaranteed by the government legal system.

In addition to the institutional background, socio-economic conditions need to be taken into account. Most of the self-imposed MPAs in Japan are situated near the coastal residential areas where peer-monitoring activities can be implemented at a relatively low cost. It was pointed out that, through studies in Papua New Guinea and Indonesia, all effective protected sites were able to exclude outsiders at a relatively low cost [15]. Before transferring Japanese style of community-based self-imposed MPAs to other countries, one may need to examine the cost function for enforcement activities including peer-monitoring mechanism among local stakeholders. The Japanese style would not be functional in an area where expected cost of enforcement is high and a stakeholder group has little interest for the protection.

#### Acknowledgements

This work was supported by the Nippon Foundation. Acknowledgements are also extended to officials in national and prefectural governments for their assistance in data collection and reviewing this text. Messrs Michael Clark (NOAA, USA), Shinichiro Kakuma (Prefectural Government of Okinawa), Satoshi Maekawa (WWF Japan), and Mitsutaku Makino (Fisheries Research Agency, Japan) provided insightful comments to the earlier draft of the text.

#### References

- [1] WSSD. World summit on sustainable development plan of implementation. Johannesburg, South Africa. 2002. Available at < [www.un.org/jsummit/html/documents/summit\\_docs/2309\\_%20planfinal.htm](http://www.un.org/jsummit/html/documents/summit_docs/2309_%20planfinal.htm) > .
- [2] IUCN world commission on protected areas (IUCN-WCPA). Establishing resilient marine protected area networks—making it happen. Washington, DC: IUCN—WCPA, National Oceanic and Atmospheric Administration and the Nature Conservancy; 2008 Available at < [http://cmsdata.iucn.org/downloads/mpanetworksmakingithappen\\_en.pdf](http://cmsdata.iucn.org/downloads/mpanetworksmakingithappen_en.pdf) > .
- [3] Convention on biological diversity. Marine and coastal biological diversity. Decision VII/5 at the seventh conference of the parties, Kuala Lumpur, 9–20 February 2004. Available at < [www.cbd.int/marine/decisions.shtml](http://www.cbd.int/marine/decisions.shtml) > .
- [4] Maekawa S, Yamamoto T. Status of marine protected areas in Japan (2009). Evaluation of progress towards the 2012 MPA goal of CBD and challenges in the future. Tokyo: WWF Japan; 2009.
- [5] Matsuda H, Makino M, Castilla JC, Oikawa H, Sakurai Y, Tomiyama M. Marine protected areas in Japanese fisheries: case studies in Kyoto, Shiretoko and Ise Bay. In: Proceeding of international symposium on integrated coastal management for marine biodiversity in Asia. 2010: p. 59–63.
- [6] Makino M, Matsuda H, Sakurai Y. Expanding fisheries co-management to ecosystem-based management: a case in the Shiretoko world natural heritage area, Japan. *Marine Policy* 2009;33(2):207–14.
- [7] Francour P, Harmelin JG, Pollard D, Sartoretto S. A review of marine protected areas in the northwestern Mediterranean region: siting, usage, zonation and management. *Aquatic Conservation-Marine and Freshwater Ecosystems* 2001;11(3):155–88.
- [8] World Bank. Scaling up. Marine management. The role of marine protected areas. Washington DC: World Bank; 2006.
- [9] Yamamoto T. Development of a community-based fishery management system in Japan. *Marine Resource Economics* 1995;10(1):21–34.
- [10] Aotsuka S. The history of legal system in Japanese fisheries. Tokyo: Hokuto shobo; 2000. in Japanese.
- [11] OECD. Review of fisheries in OECD countries: policies and summary statistics 2008. Paris: OECD publisher; 2009.
- [12] Makino M, Matsuda H. Co-management in Japanese coastal fisheries: institutional features and transaction costs. *Marine Policy* 2005;29(5):441–50.

- [13] Ostrom E. *Governing the commons: the evolution of institutions for collective action*. New York: Cambridge University Press; 1990.
- [14] Ostrom E, Burger J, Field CB, Norgaard RB, Policansky D. Sustainability—revisiting the commons: local lessons, global challenges. *Science* 1999; 284(5412):278–82.
- [15] McClanahan TR, Marnane MJ, Cinner JE, Kiene WEA. Comparison of marine protected areas and alternative approaches to coral-reef management. *Current Biology* 2006;16(14):1408–13.