

Chapter 1

Prologue: What Is Satoumi?



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Abstract Satoumi contributes to achieve various Sustainable Development Goals (SDGs) and is relevant to the Convention on Biological Diversity (CBD) mandate. The definitions of Satoumi are highly variable, but “activities and processes of environmental conservation and resource management in coastal areas with involvement of diverse people inside and outside coastal communities” would be the most overarching definition of Satoumi creation. Satoumi creation requires Satoumi science as a transdisciplinary science in extremely complicated and highly uncertain social-ecological systems. This book focuses on the process in which residential researchers and bilateral knowledge translators use integrated local environmental knowledge (ILEK) to support Satoumi creation. This book comprises four parts. Part I summarizes history and the global impact of Satoumi and roles of women in Satoumi in three chapters. In Part II, cases in Shiraho and Hinase (Japan) and Indonesia are introduced. Part III introduces cases in Okinawa City (Japan), Malawi, and Fiji. Part IV introduces cases in Onna Village and Kashiwajima (Japan) and Florida (USA).

Keywords Satoumi definition · Active measures · Passive measures · Transdisciplinary science · Residential researcher · Knowledge translator

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1.1 Significance of Satoumi in the World

Coastal areas, ecosystems, biodiversity, and fishery resources have been devastating worldwide because of diverse reasons. To solve this problem, not only top-down efforts by governments and organizations at various spatial scales and governance levels but also bottom-up activities that local people take initiative are required. The Sustainable Development Goals (SDGs) proposed by the United Nations in 2015 and the Convention on Biological Diversity (CBD), to which 196 countries are currently signatories, suggest the need to protect the world's coastal ecosystems, biodiversity, and fisheries resources. We believe Satoumi contribute to achieve various SDG targets including SDG 14 "Conserve and sustainably use the oceans, seas and marine resources for sustainable development" and there is obvious relevance of Satoumi to the CBD mandate (see Chap. 3).

Of the 120 million people in the world whose livelihoods depend on fisheries sector, including fish distribution, 90% are involved in small-scale fisheries. Ninety percent of these people live in developing countries, and 95% of their landings are consumed locally. Fifty percent of these people are women, and about six million live in poverty, earning less than US\$1 a day (FAO 2015).

Indigenous peoples in coastal areas depend on the landing of these small-scale fisheries for their lives, and a study of 1900 coastal communities (27 million people) in 87 countries (Cisneros-Montemayor et al. 2016) found that indigenous peoples consume about two million tons of seafood annually (2% of the global total). The per capita consumption was 15 times higher than that of non-indigenous people.

These small-scale fishers and indigenous peoples are vulnerable to environmental and socioeconomic changes and can easily lose their livelihoods if coastal ecosystems, biodiversity, and fisheries resources are not properly managed. They can, under certain conditions, be effectively managed as common pool resources (commons) of the communities (Ostrom 1990). One of the objectives of this book is to analyze the process of effective management of the commons using Satoumi concepts and approaches developed in Japan and around the world.

1.2 Definition of Satoumi

Satoumi processes are embedded in social-ecological systems composed of multidirectional interactions between diverse people in coastal communities and ecosystems, with huge complexities and uncertainties (Berkes et al. 2003; Folke 2007; Ostrom 2009). Diverse actors/stakeholders are involved in these complex systems to interact from different contexts, history, and worldviews. Satoumi bears different meanings and values among relevant actors, resulting in a wide variety of perceptions about coastal social-ecological systems. Therefore, the definitions of Satoumi would also be highly variable reflecting complexities of the Satoumi.

In 2009, a joint research meeting on Satoumi which one of the authors (Kakuma) represented was held at Kyushu University. During this research meeting, 13 people who are involved in Satoumi creation in various parts of Japan announced their own definitions of Satoumi, which were diverse enough reflecting complexities of social-ecological systems. Among them, Osamu Matsuda who has been deeply involved with Satoumi in the Seto Inland Sea suggested that we should respect various ideal ways of involvement between people and the sea, rather than establishing exclusive definitions (Kakuma 2011). Subsequently, Matsuda explained that the term Satoumi is a comprehensive concept prescription, which is widely recognized but cannot be easily defined in specific terms, just like the term “wise use” (Matsuda 2013). Whereas the most typical aspect of Satoumi consists of activities intended to enhance biodiversity and productivity by direct human intervention in coastal areas, these activities are not all of Satoumi creation. It is important that people are closely involved and implementing environmental conservation and resource management in coastal areas. “Activities and processes of environmental conservation and resource management in coastal areas with involvement of diverse people inside and outside coastal communities” would be the most overarching definition of Satoumi creation.

Let us go over the active measures and passive measures (Berque and Matsuda 2011) for Satoumi creation appeared in Foreword once more. Active measures are literally the activities in which direct human intervention is implemented. On the other hand, passive measures are less clear the relationship between people and the sea. In many cases, government organizations also support active measures when it comes to projects related to Satoumi. The fisheries multi-functionality program in Japan started by the Fisheries Agency in 2013 supported activities that fishers led to protect seagrass and algal beds, tidal flats, coral reefs, and inland waters. Almost all activities in the list were active measures except for monitoring. For example, activities to protect coral reefs included coral planting, crown-of-thorns starfish extermination, and seaweed removal, while activities to protect seagrass and algal beds included the removal of predators such as sea urchins and rabbit fish, cleaning of bedrock, and providing matured algae and seagrass planting. However, the “Satoumi Creation Manual” published by the Ministry of the Environment of Japan (Ministry of the Environment, Japan 2011a) defined that reducing the volume of land-based contaminants flowing into the sea and establishing no-take zones (passive measures) were also human interventions. In other words, human interventions include direct interventions (active measures) and indirect interventions (passive measures). It is important to properly combine these active and passive measures for the Satoumi creation. Most of the nine regions of Satoumi creation introduced in this book are successful cases of such combinations.

1.3 Satoumi Science as Transdisciplinary Knowledge Co-production

Satoumi creation requires not only interdisciplinary sciences that integrate natural sciences, social sciences, and humanities but also transdisciplinary sciences incorporating co-design of research agenda, co-production of integrated knowledge, and co-delivery of research outcomes in collaboration with diverse actors/stakeholders outside academia (Mauser et al. 2013; Sato 2020). In the dynamic and adaptive processes of transdisciplinary science, scientists, experts, and local stakeholders closely collaborate with each other in all stages of research with the aim of solving complicated challenges that are difficult to deal with. As opposed to conventional discipline-based sciences which are driven by the curiosity of scientists subdivided into fields of expertise aiming at the development of science itself, transdisciplinary science can be characterized as issue-driven and solution-oriented sciences driven by real-world problems, with the aim of integrating diverse knowledge sets emerging among stakeholders including academia (Sato et al. 2018b). The transdisciplinary co-design, co-production, and co-delivery processes are also capable of mobilizing both scientific and societal processes in parallel, simultaneously producing academic and societal impacts through adaptive processes and mutual learning (Lang et al. 2012).

Social-ecological systems are extremely complicated and highly uncertain, and challenges that the social-ecological systems in Satoumi areas face are also extremely complicated, ill-defined, and extremely difficult to solve with diverse trade-offs and synergies (“wicked problems”). This is why solving problems in Satoumi areas is not easy when scientists and experts from outside the community define the problems and implement research without the involvement of the local people. It is the local people who understand the real nature of the complicated local problems the best. With the premise that the local people act as the main entity in devising the solutions, making decisions, and putting them into actions, science should provide support for them (Sato 2020). Accordingly, scientists, experts, and other actors from outside the community should collaboratively think about the problems in Satoumi with local stakeholders and learn from each other to define the problems, produce knowledge, and put the research results into action together. We propose that we call the transdisciplinary science to promote knowledge co-productions to provide solutions in Satoumi through adaptive processes as “Satoumi science.”

1.4 Books and Articles on Satoumi Thus Far

The results of the pioneer research on Satoumi by Tetsuo Yanagi are summarized in *Satoumi Theory* (Yanagi 2006) and *Satoumi Creation Theory* (Yanagi 2010). Eight authors including Tamiji Yamamoto compiled a comprehensive guide titled “Satoumi—New Concept for the use of Coastal Seas,” under the supervision of

the Japanese Society of Fisheries Science (Yamamoto 2010). Also, the Japanese Society of Fisheries Science put together a special issue titled “My idea, sense, and approach to Satoumi Part I/Part II” in their journal and introduced a collection of opinions from 12 experts (Japanese Society of Fisheries Science 2013, 2014). Concerning the cultural aspect of Satoumi, Fukashi Setoyama wrote “Living in Satoumi” (Setoyama 2003), while Toshihide Innami and others compiled “Nature and Life of Satoumi—Past, Present, and Future of Ocean and Lake Resources” (Inami 2011). In addition, concerning the institutional aspect, Mitsuru Nakajima wrote “What Is Satoumi: Coastal Fisheries Use and the Uses of Local Rules,” while Takashi Hidaka compiled “Satoumi and Coastal Area Management—Managing Satoumi” (Hidaka 2016).

Similarly, outside Japan, many articles were published at the International Satoumi Workshops, which have been held every year somewhere in the world since 2008 (the workshop reports can be obtained from the International EMECS Center website [n.d.](#)), and the Secretariat of the Convention on Biological Diversity published their 61st technical report that introduced Satoumi in ten coastal regions in Japan (SCBD 2011).

The primary difference between these books/articles and this book is that this book deeply analyzes the diverse problems and challenges of Satoumi areas within and outside Japan by looking Satoumi with different angles through the lenses of diverse stakeholders including scientists. Many of the authors of the chapters are not university researchers but those who are involved in the creation of Satoumi in local communities in various positions, from NPO workers to a fisher, a fisheries cooperative worker, an employee of food processing company, researchers at private research institutes, and researchers working for the central or local municipalities.

1.5 Integrated Local Environmental Knowledge Project

This book is based on the outcomes of an international transdisciplinary research project titled “Creation and Sustainable Governance of New Commons through Formation of Integrated Local Environmental Knowledge” (ILEK project), funded by the Research Institute for Humanity and Nature, Kyoto, Japan, and conducted from 2012 for 5 years (Sato et al. 2018a). The concept of the integrated local environmental knowledge (ILEK) developed in this project has its roots in accumulation of analyses of knowledge systems in local communities including traditional ecological knowledge (TEK Berkes 2008, Berkes et al. 2000) and local ecological knowledge (LEK, Olsson and Folke 2001). These analyses have mainly focused on typologies of the knowledge systems to indicate the importance of alternative knowledge systems to supplement the limitations of scientific knowledge productions. In contrast, ILEK strongly focuses on dynamism of knowledge co-production in the transdisciplinary processes, with clear perspectives to develop solutions in the complex social-ecological systems by integrating heterogeneous knowledge systems from academia and other diverse sources including traditional, culturally specific,

experience-based knowledge systems (Sato et al. 2018b). Dynamic and adaptive transformation of ILEK through collaborations among diverse knowledge producers provides bases for collaborative decision-makings and collective actions to tackle with “wicked problems” associated with Satoumi creation processes.

In the research in ILEK project, we identified and analyzed the roles of important actors in the transdisciplinary processes: residential researchers and bilateral knowledge translators. The term residential researchers refers to the researchers who reside and base themselves in a certain local community and become a member of the local community simultaneously as being an expert to produce scientific knowledge (Sato et al. 2018b). Bilateral knowledge translators are defined as the persons, organizations, or groups that play the role of bridging the gap between heterogeneous knowledge systems and technologies (including social technologies) emerging from diverse framing by creating their new meanings (Sato 2016; Sato et al. 2018b). Driven to solve local issues, they reorganize and compile diverse scientific knowledge and assist the process of using the knowledge for mobilizing collective actions among diverse actors/stakeholders. Simultaneously, they play the role of widely communicating the wisdom and ingenuity that various local stakeholders have gained through their actions aimed at solving the issues. This book also focuses on the process in which residential researchers and bilateral knowledge translators use ILEK to support Satoumi creation. The roles of residential researchers are discussed in detail in Chap. 12, while the roles of bilateral knowledge translators are examined in Chap. 9.

1.6 Structure of This Book and Outline of Each Chapter

This book comprises four parts. Part I titled “Significance of Satoumi Concept and Growing Satoumi Actions” summarizes history of the global spread of activities for Satoumi creation, the global impact of the Satoumi concept, and roles of women in Satoumi in three chapters. In Part II titled “Enhancing Ecosystem Function by Direct Human Intervention,” cases in Shiraho in Okinawa Prefecture, Hinase in Okayama Prefecture, and Indonesia where active measures are being implemented for Satoumi creation are introduced. Part III titled “Managing and Enriching Coastal Resources” introduces cases in Okinawa City in Okinawa Prefecture, Malawi in Africa, and Fiji in the Pacific where fishery resource management is implemented as passive measures. Part IV titled “Building Broader Connections Between People and the Sea” introduces cases in Onna Village in Okinawa Prefecture, Kashiwajima Island in Kochi Prefecture, and Florida in the United States where promotion of interactions between local and urban areas and cooperation between divers and fishers and between professional scientists and citizen scientists are being implemented.

1.6.1 Part I: Significance of Satoumi Concept and Growing Satoumi Actions

Chapter 2, “The History and Future of Satoumi Concept,” summarizes the history of the emergence and spread of the Satoumi concept in Japan as well as outside Japan with its future perspectives. Although activities for Satoumi creation had already been conducted in various regions in Japan, the first time the term “Satoumi” appeared in journal articles and books was in 1998 when Tetsuo Yanagi, the author of Chap. 2, described it. Many marine policies in Japan started to take up the concept of Satoumi following these publications. In particular, the Ministry of the Environment established projects titled Satoumi creation and compiled a manual for creating Satoumi. Satoumi is also spreading to outside Japan.

Although the Satoumi concept initially received criticism due to differences in the ways of thinking between Western countries and Japan/Asia on environmental conservation and resource management, the concept was gradually accepted afterward. Since 2008, the International Satoumi Workshop has been held annually somewhere in the world. Chapter 2 also provides a theoretical analysis of similarities and differences among Satoumi, EBM (Ecosystem-Based Management), CBM (Community-Based Management), MSP (Marine Spatial Planning), and ICM (Integrated Coastal Management). Furthermore, the chapter logically and empirically discusses the process of improving the material circulation in coastal areas through Satoumi creation in the future.

In Chap. 3, “Global Effect of the Satoumi Concept: Harmony of Human Society with the Ocean Biome,” the global impact of the Satoumi concept is analyzed from the viewpoint of Westerners. Western and Asian philosophies for the interactions of humans and nature have, at least in the past, exhibited differential approaches. A major theme of historic Western environmental philosophy is human separation from nature, with humans and nature comprising two separate and often opposing elements. Asian environmental philosophy has generally had a theme that humans and the environment must harmonize, with humans as an integral part of the environment. It is from this environmental philosophy that the concept of Satoumi had been born.

In this chapter, the integration of Satoumi and MPA (Marine Protected Area) is analyzed in detail. Environmental conservation and resource management in coastal areas in the United States focus on MPAs. Along with the international frameworks such as UNESCO MAB: Man and the Biosphere Programme, the development of the MPA system began as a national project in the United States under the presidential decree in 2000. Although biodiversity conservation used to be the most serious issue in the US MPAs, major issues have changed to ecosystem conservation, balanced resource use, participation of local residents, and consideration of traditional cultures. Therefore, it concludes that the introduction of the Satoumi concept would also be effective for environmental conservation and resource management in coastal areas in Western societies.

Chapter 4 deals with “Roles of Women in Satoumi” as titled. The column chapter examines the diverse roles of women in the process of Satoumi co-creation in Japan, by exploring women-led examples of creating linkages between the community and the coastal environment. This chapter also describes “Ama” (women divers) as direct actors in fishing activities and as sustainability and TEK (traditional ecological knowledge) stewards in Satoumi.

1.6.2 Part II: Enhancing Ecosystem Function by Direct Human Intervention

In Chap. 5, “Enlivening Ecosystems with Human Hands: Building Satoumi Through Coral Reef Culture,” the focus is Shiraho village on Ishigaki Island in Okinawa Prefecture. The characteristics of Satoumi creation in Shiraho are that the restoration and use of a stone tidal weir, which is an active measure, not only enhanced biodiversity and productivity but also fostered the sense of ownership for the Satoumi. This process brought about the passive measures including the greenbelt planting activities for preventing red soil runoff and the Sunday Market of the local products. The cultural aspect of Satoumi, literally the coral reef culture, connected the local people who had been torn by issues arising from the airport construction and integrated the conservation activities of environmental organizations and local communities with varying purposes. Also, the essential stakeholders of the Shiraho region, the farmers, joined the Satoumi creation activities. A residential researcher played a major role in conducting the partnership-type project in which people with varying values and positions cooperated with each other.

Chapter 6 titled “Restoring Eelgrass Beds and Culturing Oysters” introduces the Satoumi of seagrass and oysters in Hinase, which is in the southeastern part of Okayama Prefecture. In this area, conservation activities including seeding of eelgrass (seagrass) and sediment improvement by scattering oyster shell are causing rapid recovery of seagrass beds, which were once lost. This is a region where active measures for Satoumi creation are working most effectively. The area of seagrass beds decreased from 590 ha in the 1950s to 12 ha in 1985, yet the area recovered up to 250 ha in 2015. Restoration activities of seagrass beds were initially conducted for recovering resources for small set net. However, the current main purpose is stabilizing production of oyster aquaculture through the effects of seagrass beds to stabilize the water temperature and dissolved oxygen concentration. The activities initiated by the leadership of a single fisher have been carried out continuously for more than 30 years. The chapter also discusses the technical issues for the restoration of seagrass beds, carrying back activities of seabed debris, direct selling of fishery products at a market, and adoption of blue carbon.

Satoumi is also spreading to countries in Southeast Asia, such as the Philippines and Thailand. Chapter 7 titled “Reviving Abandoned Aquaculture Ponds and Coastal Areas by Integrated Multi-trophic Aquaculture” discusses the Satoumi

areas in Indonesia, focusing on those in the West Java region in particular. Unlike other chapters, this chapter focuses on the technical aspect of the active measures that are referred to as integrated multi-trophic aquaculture (IMTA). While shrimp aquaculture is widely practiced in this region, abandoned fishponds due to prevailing diseases have been causing severe environmental problems. When a researcher who learned the concept of Satoumi in Japan returned to Indonesia and was assigned to be in charge of the revitalization project for abandoned fishpond areas by the government, he established a revitalization plan using the Satoumi concept that involves participation of local residents. As a result, they achieved to improve the water quality and productivity of closed water systems through IMTA of shrimps, fish, seaweed, and bivalves. The local fishers also have continued to plant mangroves around their culture ponds for protecting them from the wave erosion and maintaining their water quality. Indonesia is promoting the Satoumi creation as a national policy, and the Satoumi concept is believed to be the most widely known in the country after Japan.

1.6.3 Part III: Managing and Enriching Coastal Resources

Chapter 8 titled “Conserving Multiple Coral Reef Resources” discusses Okinawa City located on the eastern coast of central Okinawa Island. In this area, a leader of fishers and a prefectural fisheries extension officer have functioned as bilateral knowledge translators. The leader established an NPO and implemented a wide variety of activities, from passing down marine culture, environmental education, research, and conservation activities, together with coral aquaculture and planting for Satoumi creation. These activities were taken over by the Satoumi Fisheries Council established afterward, and the council has been implementing various passive measures including length limits for the most important fish species, the establishment of an MPA, and resource and environmental monitoring by fishers.

Chapter 8 also analyzes the institutional issues of Satoumi in detail. It summarizes the complex relationship between common fishery rights and customs in Okinawa, involvement of non-fishers in Satoumi creation, and response to increasing marine recreational use.

Chapter 9 titled “Villagers Managing Lake Fisheries Resources by Themselves: Mbenji Islands in lake Malawi” introduces the Satoumi (Sato-lake, to be exact) in Lake Malawi in East Africa. Although most cases of the Satoumi creation process documented so far took place in Japan, which is a developed country, there are Satoumi areas functioning in various parts of the world, and no least developed country in Africa is an exception. Moreover, in the same way as Satoumi creation in marine areas, Sato-lake and Sato-river creation activities are also carried out in the shore of lakes and rivers with close human interactions.

Chapter 9 analyzes the activities for aquatic resource management, which have been conducted by the residents of riparian communities in Lake Malawi since the 1950s. In this region, the village’s traditional authorities and fishers over three

generations have effectively managed the seasonal closure of fisheries during spawning periods while being rooted in the local culture. The villagers themselves, such as chiefs and elders, took the role of bilateral knowledge translators and translated governmental regulations to fit to local framing and used them spontaneously. It is also interesting that seasonal closure, which started as an arrangement to ensure the safety of fishers from dangerous thunderstorms, led to Satoumi processes of resource management as a by-product. The chapter also provides a detailed analysis of conditions and actors required for people in poverty in a least developed country to promote the Satoumi process despite various restrictions and difficulties.

Chapter 10 titled “Protecting Fisheries Resources Through Marine Protected Area Networks: Fiji” analyzes the rapid advancement of a network-based management project for fishery resources and ecosystems in Fiji, which is referred to as the Fiji Locally Managed Marine Area (FLMMA). The central activities of the FLMMA project are the establishment and management of MPAs in marine areas referred to as “*qoliqoli*,” which is similar to areas of common fishery rights in Japan. Many institutions, including the University of the South Pacific, the Fisheries Department of the Government, and environmental NGOs, are supporting the activities of the communities. In one village, integrated local environmental knowledge and their perceptions dynamically transformed through the mediation of a bilateral knowledge translator and led to various collective actions for Satoumi creation.

This chapter summarizes how three types of MPAs are selected and run depending on the target resources, the size of fishing grounds, and other factors, in addition to how MPAs are being used for tourism in four regions, resource management of sea cucumbers, and release of giant clams. The chapter also discusses the balance between ecosystem conservation and resource use, which is an important issue in Satoumi creation.

1.6.4 Part IV: Building Broader Connections Between People and the Sea

Chapter 11 titled “Connecting Local Regions and Cities Through Mozuku Seaweed Farming and Coral Reef Restoration: Onna Village, Okinawa” introduces Onna Village, which is a representative Satoumi of Okinawa. In this area, a worker of fisheries cooperative functions as a residential researcher and a bilateral knowledge translator. The Onna Village Fisheries Cooperative was the first to develop the aquaculture techniques for all of three major seaweeds in Okinawa: Mozuku, Hitoegusa, and Umibudo. These techniques were applied to the aquaculture and outplanting techniques for corals, and today, they have become the most effective coral reef restoration techniques in Japan (Okinawa Prefecture Environment Department Nature Conservation Division 2017). Production of seedlings and aquaculture of Mozuku, aquaculture and outplanting of corals, and crown-of-thorns starfish extermination are active measures for Satoumi creation conducted to enhance

biodiversity through human interventions. Additionally, the Onna Village Fisheries Cooperative is most advanced in Okinawa in terms of measures for red soil pollution, which are passive measures. These activities have been carried out in an adaptive manner according to multiple plans including the Churaumi (beautiful sea) Plan.

In Onna, other passive measures such as promotion of fish distribution and interactions among people are also actively conducted. In particular, new values of Satoumi are being created by the Mozuku Foundation established through the collaboration of a fisheries cooperative, a food processing company, and consumers' cooperatives. The funds supplied through the foundation are spent on the conservation activities for coral reefs, which include aquaculture and outplanting of corals.

Chapter 12 titled "Divers and Fishermen Working Together to Create Satoumi" introduces Kashiwajima Island in the southwestern part of Kochi Prefecture. The sea of Kashiwajima is a Satoumi area where over 1000 fish species gather and provide humans with rich blessings. The main characteristic of the Satoumi creation in this area is that a worker of the NPO Kuroshio Zikkan (feeling) Center effectively functions as a residential researcher. This chapter analyzes the characteristics, roles, and issues of residential researchers compared to visiting researchers in detail.

Since Kashiwajima is one of the most popular diving spots in Japan, the Satoumi creation in this area is characterized by the cooperation between fishers and divers. The installation of artificial spawning beds for bigfin reef squid *Sepioteuthis lessoniana* implemented as active measures was especially effective for Satoumi creation. Great achievements for spawning of bigfin reef squid were made through the application of "Shibazuke" or a traditional artificial spawning bed used by fishers based on indigenous knowledge. The divers who had been in conflict with fishers applied the technique, in combination with scientific knowledge of the residential researcher. The researcher has also carried out various passive measures with the key phrases of "protecting the nature and culture" and "re-connecting people to people and people to nature" by "regarding the whole island as a museum."

Chapter 13 titled "Models for Implementing the Satoumi Concept via Residential Research Institute Collaborations with Citizen Scientists in the United States" introduces activities implemented in Florida, USA. A private research institute Mote Marine Laboratory and the volunteer citizen scientists function as residential research institutes/researchers and bilateral knowledge translators.

Their active measures include releasing scallop seedlings for restoring resources, planting of corals by using innovative technologies, and releasing and monitoring snook (*Centropomus undecimalis*), which is an important local fish resource. Concerning passive measures, the large number of volunteer researchers are performing environmental monitoring and educational activities.

1.7 Functions and Issues of Satoumi

1.7.1 *Functions of Satoumi*

The important purposes of Satoumi creation are environmental conservation that aims for clean seas and resource management that aims for rich seas. In terms of functions, the purposes can be divided into (1) enhancement of biological productivity (including management of fishery resources), (2) environmental conservation (including biodiversity enhancement and improving material circulation), (3) promotion of interactions (including environmental education and improving fish distribution), and (4) passing down the culture. The nine areas introduced as case studies in this book have various activities with diverse functions. We organized the nine Satoumi areas documented in this book by focusing on their functions as shown in Table 1.1. This categorization reflects our judgment on reading each chapter, not the authors of the chapters. We hope the readers would read all the chapters without preconceived images.

1.7.2 *MPA (Marine Protected Area)*

In this book, MPAs are discussed in many chapters. In Chap. 3, “Effect of Satoumi Concept to the World,” and Chap. 10 on Fiji, the main theme is MPAs. Similarly, Chap. 8 on Okinawa City, Chap. 9 on Malawi, and Chap. 13 on Florida also have MPAs. MPAs themselves are not Satoumi, but rather they are the tools for Satoumi creation.

In Japan, MPAs include marine parks, protected waters, and various types of no-take zones. The Ministry of the Environment defines the MPAs in Japan as “Marine areas designated and managed by laws or other effective measures for purposes of conservation of biodiversity supporting sound structures and functions of marine ecosystem and sustainable use of ecosystem services in consideration of the utilized form” (Ministry of the Environment, Japan 2011b). Similarly, MPAs is the collective term for marine parks, reserves, marine sanctuaries, no-take zones, and tabu areas outside Japan.

As shown in Chap. 10, the types of MPAs vary widely, including complete no-take zones throughout the year, areas where certain fishing methods or certain species are forbidden, and areas where a certain period of each year is set as a no-take period. MPAs also vary in size, from a few hectares to a few tens of millions of hectares. Some MPAs are legally established as seen in the United States, while others are autonomously established by local people, as seen in Fiji, Malawi, and Okinawa City. The main purposes of their establishment also differ, from the conservation of biodiversity to management of fishery resources to promotion of the tourism.

Table 1.1 Functions of Satoumi

Function of Satoumi	Shiraho	Hinase	Indonesia	Okinawa City	Malawi	Fiji	Onna Village	Kashiwajima	Florida
1. Enhancement of biological productivity (fishery resource management)	△	○	⊗	⊗	⊗	⊗	○	○	○
2. Environmental protection (biodiversity enhancement) (improving material circulation)	○	⊗	○	○	△	△	○	△	○
3. Promotion of interaction (environmental education) (fish distribution)	○	○	○	○	○	○	⊗	⊗	⊗
4. Passing down the culture	⊗	△	△	△	○	○	△	○	△

○ signifies a function that is present, ⊗ signifies the major function, and △ signifies the minor function

However, MPAs are not panaceas and cannot solve everything, and establishing MPAs does not transform the coastal area into Satoumi right away. MPAs are no more than just a tool in creating Satoumi. Some MPAs are in fact contradictory to Satoumi. They are the type of MPAs that removes people from the area. For example, although the MPA area is inhabited by people today, Sabah State in Malaysia once established an MPA by removing the marine tribe Sama (Bajau) who had illegally inhabited the area. There have also been conflicts in West Africa due to the establishment of MPAs by removing people (Sekino 2014). To discuss Satoumi-type MPAs that can balance between ecosystem conservation and sustainable resource use is also a theme of this book.

For MPAs to function as a tool in Satoumi creation, individual MPAs need to be effective, and networks for MPAs need to be constructed. MPA networks include ecological networks, which stand for spatial and physical connections, and social networks, which signify the connections among people, organizations, and information (Kakuma 2017). Because constructing ecological networks of MPAs requires detailed information regarding the ecology of target organisms and the physical environment such as current, these networks are uncommon in Satoumi globally. However, international networks are being constructed with regard to the social networks.

1.7.3 Balance Between Ecosystem Conservation and Resource Use

For Satoumi creation, it is crucial to achieve the balance between ecosystem conservation and resource use. Chapters 2 and 3 discuss how the Western countries differ from Asian countries in terms of cultural background and that they tend to consider the protection of nature by separating humans from nature. For this reason, Chap. 2 analyzes that nature reserves experience insufficient resource use, while areas with human activities experience excessive resource use. Chapter 10 provides a critical analysis of the assertion that “the primary cause of coral reef ecosystem deterioration is fisheries, and fisheries need to be restricted strictly to achieve the recovery to the pristine state of the ecosystem.” In this manner, Western countries have a tendency to prefer the preservation of the pristine nature, with some people hating human intervention in nature. This kind of mindset is clearly contradictory to the Satoumi concept. Satoumi creation requires the conservation of ecosystems through close involvement of people in the sea, at the same time as seeking the sustainable ways to use the resources.

1.7.4 Technical Issues of Satoumi

Partially because of the fact the Satoumi in the Seto Inland Sea initially drew attention in Japan, the primary technical issue of Satoumi was improving material circulation. In the book *Satoumi Theory* (Yanagi 2006), it is asserted that the establishment of Satoumi requires “the realization of the thick, long and smooth material circulation in the coastal sea.” “For example, although the occurrence of red tide realizes temporally thick material circulation from nutrients to phytoplankton, the material circulation is short as most of the phytoplankton die without transferring the nutrients to higher zooplankton species. Moreover, dead phytoplankton cause oxygen deficient water masses on the sea floor, which destroy bottom-dwelling ecosystems, including benthos, thereby hindering smooth material circulation” (Yanagi 2006). In addition to the physical transport by flow and diffusion, biological transport also plays a major role in the material circulation in coastal areas. Fisheries promote the circulation of nutrients and organic matter. This is because the nutrients and organic matter released by humans become absorbed in phytoplankton and then stored in aquatic organisms, which are higher up on the food chain, followed by the collection by humans through fisheries (Kakuma 2011).

Many technical issues are present for active measures intended to enhance the biodiversity and productivity by direct human intervention. This is the aspect of Satoumi where the contribution of natural sciences is sought. Many chapters in this book provide case studies in which technical issues in active measures were solved by using scientific innovations.

1.7.5 Institutional Issues of Satoumi

In Satoumi where local people are involved closely, there are many institutional issues including the relationship between fishery rights and customs and ways of involvement of non-fisher people (local and urban residents) in Satoumi. Chapter 8 provides a detailed analysis of this matter (issues related to commons and local rules).

In Japan, except for special cases, common fishery rights are established in all areas of shallow waters where Satoumi creation is conducted. However, Okinawa has a community mindset that “the sea belongs to everyone,” and the local residents have historically harvested resources in shallow coral reefs. In contrast, in other areas of Japan, with the increase of marine leisure, it is becoming more difficult to manage the coastal areas where fishers had been using based on their fishery rights (Hidaka 2016). Satoumi creation requires solving these institutional issues.

Once again, this book deeply analyzes and explains the diverse Satoumi within and outside Japan with regard to the specific issues of each area by looking at the multilateral aspects of Satoumi. We hope this book will deepen the readers’

understanding of the functions and issues of Satoumi, providing specific hints for Satoumi creation and making contributions to solving various issues of Satoumi in the world.

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