

CONTRIBUTION 9.1

Promoting a Fishery-Centered Blue Economy Through Co-Benefits and Knowledge Sharing

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ABSTRACT

The Caribbean region is currently witnessing a diverse range of projects aimed at promoting the blue economy. The Japan International Cooperation Agency (JICA) is formulating a strategy that recognizes co-benefits and knowledge sharing as fundamental drivers for advancing the blue economy. This strategy encompasses several stages: viz. 1. Development of concrete examples through pilot activities; 2. Extraction of knowledge from these examples (including good practices and lessons learned) and accumulation in a comprehensive database or toolbox; 3. Implementation of seminars and workshops to facilitate knowledge sharing and the formation of a multilateral cooperation framework or platform involving governments, donors, international organizations, and public-private-academic sectors; and 4. Development of an international strategy or initiative to promote the blue economy and the establishment of a positive cycle that enhances the priority of pilot activities in national development plans, increases budget allocation and donor funding, and implements additional pilot activities based on the initiative. These components draw upon Japan's extensive experience in co-benefits, such as fisheries resource co-management, food value chains, and the concept of satoumi, which seeks to enhance production and biodiversity through harmonious human-nature interaction. Furthermore, the strategy incorporates effective mechanisms for knowledge sharing, including the utilization of an online knowledge database or toolbox specifically focused on small-scale coastal fisheries, as well as national public presentation events featuring representatives from successful fishermen groups. In this context, JICA has been actively implementing pilot projects in the Caribbean, including the co-management of Fish Aggregating Devices (FADs), the integration of food value chains with tourism sector through processing seafood products and diver-driven lionfish eradication as well as the satoumi approach through utilizing seaweed cultivation. In future, collaborative efforts with the Caribbean Regional Fisheries Mechanism (CRFM), governments, and donors, including JICA, are expected to facilitate knowledge sharing, formulation, and accumulation of further examples, effectively promoting the blue economy.

KEYWORDS: *blue economy, co-benefit, knowledge sharing, pilot activities, toolbox, platform, co-management, food value chain, satoumi*

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1. INTRODUCTION

Various projects are currently underway in the Caribbean region aimed at promoting the blue economy (e.g., Rustomjee 2016, Phang et al. 2023). These activities include the development studies, CARIFICO project and COASTFISH project conducted by JICA, which have accumulated strategies and good practices on fisheries development and co-management (e.g., JICA 2012, Tamura et al. 2018). Japan's approach is grounded in pilot activities, offering several key strengths (*Mikuni 2017*). First, it demonstrates the effectiveness of the approach by illustrating tangible examples. Second, it establishes and strengthens collaborative frameworks through on-site collaboration, bringing together fisherfolks, government authorities, researchers, and Japanese experts who work cooperatively in the field. Third, it fosters practical skills through on-the-job training, enabling individuals to acquire the implicit knowledge and practical expertise required for project planning and implementation. These processes of Japan's approach stand on trust-based relationships with counterparts formed in the field and would strengthen Japan's comparative advantage. On the other hand, the cost-effectiveness and impact of individual projects are a challenge in these efforts. Each activity needs to be designed based on the specific conditions of the target area, such as fish species, fishing methods, fishing grounds, consumption patterns, market access, community relationships, and administrative capacity. There are no standardized manuals or guidelines available. Even if a particular activity is successful, in extreme cases, it may be difficult to adapt that case to a neighbouring fishing village.

In response to that issue, it is believed that cooperation scenarios based on the knowledge sharing of best practices and lessons learned would be effective. The following processes can be effective to facilitate this:

1. Development of concrete examples through pilot activities,
2. Extraction of knowledge from these examples including good practices and lessons learned and accumulation in a comprehensive database or toolbox,
3. Implementation of seminars and workshops to facilitate knowledge sharing and the formation of a multilateral cooperation framework or platform involving governments, donors, international organizations, and public-private-academic sectors,
4. Development of an international strategy or initiative to promote the blue economy and the establishment of a positive cycle that enhances the priority of pilot activities in national development plans, increases budget allocation and donor funding, and implements additional pilot activities based on the initiative.

By implementing these processes, it is possible to enhance the prioritization, budget allocation, and donor support, as well as the design and formulation of new projects. This creates a positive cycle of continuous improvement and progress.

In this context, we report the actual implementation of Japanese efforts in the Caribbean coast, particularly in island countries, such as the co-management of fish aggregation devices (FADs), diver-led lionfish removal, and the trial of cultured seaweed products for tourism. These are examples that illustrate the mutually beneficial relationship between the development of food value chains and tourism in the context of ecosystem conservation. In this paper, we try to provide an overview of the pilot activities as examples and discuss the blue economy development strategy.

2. METHODOLOGY

As mentioned above, the following three pilot activities, namely the integration of the food value chain and tourism sector through co-management of Fish aggregating devices (FAD), diver-led lionfish removal, and seafood processing were conducted at Grenville in Grenada, as well as Soufriere and Laborie in Saint Lucia respectively. The outline of each activity was as follows.

a) Co-management of Fish aggregating devices (FAD)

FAD reduces the fishing vessel's fuel costs and the time spent for searching fish by attracting fish and keeping them close (e.g., FAO 2012, Cabral 2014). Although larger fish such as tuna and marlin are often found in deep waters offshore, small outboard motorboats often cannot safely navigate those areas so it is not easy for local fisherfolks to catch these high valued fish. However, deployment of FAD in closer waters allows these fisherfolks to catch these fish around it (Beverly et al. 2012). Therefore, FAD has the potential to increase incomes for small-scale fisherfolks. Moreover, fisherfolks' organizations can be promoted through joint ownership of FADs and joint use of fishing grounds. Grenada Fisheries Division and CARIFICO project, funded by JICA, aims to organize fisherfolks' organization effectively and improve livelihood of local fisherfolks sustainably, carried out the pilot activity of co-management of FAD in Grenville, Grenada (Fig. 1).



Figure 1. Map of Grenada showing the Capital (Saint George's) and the target site (Grenville)

This activity was carried out in the following steps:

- 1) Consultation of fisherfolks for this pilot activity.
- 2) Decision on the design, installation location, manufacturing, and installation method of FADs.
- 3) Production of fishing gears such as drop line.
- 4) Operation, maintenance, and joint monitoring based on regulations.
- 5) Information collection of fish landed at government-run markets.
- 6) Collection of usage fees for preparing the costs for maintenance and update of FADs.

Following figure (Fig. 2) shows activities of consultation, production, installation, and operation of FAD from left to right.



Figure 2. Activities of consultation, production, installation, and operation of FAD

b) Lionfish Tournament and Cooking Demonstration

Lionfish populations in the Caribbean Sea were considered a significant and growing concern (Côté 2013). The lionfish are not native to the Atlantic Ocean or the Caribbean but are invasive species that may have introduced by the aquarium trade. There appears to be two species of lionfish currently found in the Caribbean: *Pterois volitans* and *Pterois miles* (Layman and Allgeier 2012). Both are carnivorous species that consume a wide variety of fish and crustaceans, including commercially important species and juvenile fish. They are also known to have rapid reproduction rates and voracious appetites (Ruiz-Carus et al. 2006, Morris et al. 2011). Their introduction therefore has had a detrimental impact on local marine ecosystems. Consequently, the eradication of lionfish is an urgent issue. However, the complete eradication may be unrealistic due to its rapid reproduction and the difficulties associated with removing them from marine ecosystems. The goal is therefore to control its numbers and minimize its impact on native species and ecosystems. In this context, The COASTFISH project funded by JICA, in collaboration with the Department of Fisheries of Saint Lucia and the Soufriere Marine Management Association (SMMA), a local marine management organization, held a lionfish cull tournament in Soufriere, Saint Lucia (Fig. 3).

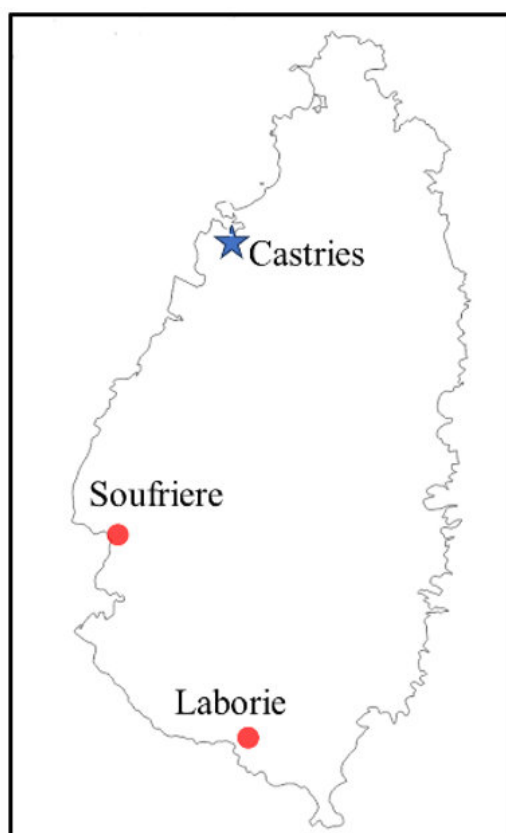


Figure 3. Map of Saint Lucia showing the Capital (Castries) and the target sites (Soufriere for lionfish tournament and Laborie for seaweed product)

This activity was carried out in the following steps.

- 1) Holding fisherfolks consultation and workshops to seek any opportunities for improvement of livelihood of local fisherfolks.
- 2) Focusing then on the diver-led lionfish removal as one of pilot activities after several discussions with relevant stakeholders including the Department of Fisheries.
- 3) Coordinating with organizations concerned to formulate the implementation body.

- 4) Designing the programme of the Lionfish Tournament and Cooking Demonstration event.
- 5) Informing and inviting fisherfolk including coral gardeners who are engaged in coral reef restoration activities in Soufriere and local dive operators to encourage participation in the event.
- 6) Requesting cooperation with local restaurants to provide cooking recipes of lionfish.
- 7) Sampling the lionfish dish based on the recipe provided.
- 8) Conducting the Lionfish Tournament and Cooking Demonstration event.

Following figure (Fig. 4) shows catching, weighing the amount, cooking and trial product of the lionfish from left to right.



Figure 4. Sceneries of activities of catching, weighing the amount, cooking, and trial product of the lionfish

c) Trial of cultured seaweed products for tourists

Since 1970s, sea moss has been popular in Caribbean region including Saint Lucia (Smith and Renard, 2002). It has been favoured by English-speaking people in the Caribbean region due to its support in the digestion of carbohydrates in those who have it and is bursting with nutritional value (Smith, 1997). Currently, sea moss is sold in the supermarket and restaurants having the sea moss drink with condense milk including other tastes, and as dried sea moss powder. Sea moss produced and sold in St. Lucia has probably been a mixture of various red algae, such as *Gracilaria* spp. and *Eucheuma* spp. rather than just one species (Smith 1997). The farming of sea moss is popular in the region since it is easy for people to start. Unemployed people from the tourism industry, which has been hit hard since COVID-19, have entered the market. However, selling sea moss has recently become difficult as export companies have demanded higher quality products in Saint Lucia. Sea moss farmers, especially small scale producers, suffer production challenges and many of them have given up the sea moss culture. Given this situation, as one of the pilot activities, the COASTFISH project, in collaboration with local seamoss farmers in small scale, undertook production trials with easy and inexpensive materials to culture seamoss that can be sold to tourists in order to assist the livelihoods of small-scale farmers in Laborie, Saint Lucia (Fig. 3, above).

This activity was carried out in the following steps.

- 1) Collecting information regarding development of simple souvenirs sold at tourist spots in Japan.
 - 2) Sharing and discussing the information collected with local sea moss farmers to decide the trial products (making ice cream and sherbet using sea moss was selected this time).
 - 3) Discussing among fisherfolks regarding efficient and less competitive seamoss farming too (promotion of the satoumi approach).
 - 3) Making trial products and calculating their production costs.
 - 4) Determining the selling price tentatively based on the production cost.
 - 5) Having tourists try out the trial products actually and rate them on taste and selling price.
- Following figure (Fig. 5) shows ingathering, cooking and the sherbet tasting of seamoss from left to right.



Figure 5. Sceneries of ingathering, cooking and the sherbet tasting of seamoss from left to right

3. RESULTS

a) Co-management of Fish aggregating devices (FAD)

As a result of activities mentioned above, the following outputs were generated.

- 1) Trust and cooperation among fishers, as well as between fishers and fishery officers, were built through a total of 119 meetings held during the project period.
- 2) The FAD Fishers Organization was established as the responsible body for co-management with a membership of 120 fishers.
- 3) The capacity of fishers and fishery officers for FADs, vertical dropline fishing, and fish storage in iceboxes was enhanced through a total of 22 workshops held during the project period.
- 4) The FAD user rules, including safety at sea, ownership, and maintenance, were formulated.
- 5) Biological and economic data were analyzed by Fisheries Officer based on the log sheet submitted by fishers
- 6) Membership fees and FAD user fees were collected, and access to outside funding sources was obtained.
- 7) FAD-caught fresh tuna has been exported to the US market after quality improvement and marketing promotion.

In addition, in order to share this knowledge within the region, the results of activities were shared at the Fisheries Ministers' Meeting and international seminars organized by CRFM.

In terms of co-management of fish aggregating devices (FAD), the outcomes are generated based on the co-benefit between the improvement of fishers' livelihoods and fisheries management (Montes et al. 2017). To sustainably establish these mutually beneficial relationships, the following measures would be necessary.

- Establishment of fisherfolks' organizations and fishing regulations,
- Restriction of membership of fisherfolks' organizations to fisherfolks participating in the production and deployment of FADs regularly,
- Grant of benefits such as prioritized support of FAD fishing permits, participation in technical training related to fishing technology to fisherfolks who actively participate in FAD activities, comply with the regulations and submission of catch data,
- Establishment of ownership in fisherfolks through early participation and leverage their experience and knowledge,
- Fosterage of relationships of trust among fisherfolks,

b) Lionfish Tournament and Cooking Demonstration

The opening ceremony of the lionfish cull tournament in Soufriere was held at the Soufriere market on 28 February 2023, which is crowded on weekends. The Minister of Commerce, Business Development, Investment and Consumer Affairs gave opening remarks. The local community people who came for shopping listened to the speech with much interest. As part of this event, a tournament to compete for the catching of lionfish was organized. The Project awarded three prizes for this tournament listed as follows.

- 1) The team with the most exterminations (quantity)
- 2) The team that exterminated the largest lionfish
- 3) The team that exterminated the smallest lionfish

A total 26 divers—3 teams of which 2 were local diving groups from resort hotels—participated in this competition. In addition, there was the coral gardeners group comprised of young fisherfolk (women and men) and individuals with a keen interest in conservation of the reefs in Soufriere. A total of 200 lb (90+ kg) lionfish were caught by divers altogether on the day. This event was recognised as a fun and educational event for both divers and the local community.

At the tasting booth, we asked 30 people gathered several questions regarding lionfish. More than 95% people answered positively about the taste.

From the survey question, we learned 68% of people had never previously consumed lionfish, primarily because of its taste and the fear of being poisoned. When asked about future effective methods of cooking lionfish, more than 80% were interested in trying grilling and steaming, and more than 90% said they would purchase it if it is sold in fillets.

Regarding price, it was shown that people in Soufriere tend to spend around EC\$ 5 to EC\$ 10 per pound, with almost 85% of respondents saying they would purchase lionfish if the price was around EC\$ 10 per pound. Therefore, if lionfish were to be sold to the public as other fish, it could become a choice for consumers.

In terms of the place to purchase lionfish, 60% of people preferred to purchase from fisherfolks directly, and 40% of them at fishery complex where it would be cleaned. None indicated that they would purchase it at the supermarkets.

With respect to the possible value chain, one option is to introduce lionfish dishes at the restaurant for the tourist. One of the restaurant chefs of resort hotels said that he introduced lionfish on the tourist menu as since the taste is delicate, and the meat is moist. He suggested offering cooking classes as one of the tourist activities for the guests. The promotion of meals made from the lionfish would be good advertisement for resort hotels and restaurants, if they were to publicise the catching and consumption of the lionfish as a means of helping the local ecosystem.

c) Trial of cultured seaweed products for tourists

The production cost for each kilogram (kg) of seamoss ice cream is EC\$71.00, including the costs for milk, whipped cream, vanilla essence, cinnamon, and other ingredients. The production cost per 50 grams (g) of this ice cream therefore would be EC\$3.5. At ice cream shops in the area that cater to tourists, a single ice cream (approximately 50 g) costs around EC\$6. If local farmers sell the seamoss ice cream (50g) for EC\$5, they would earn a profit of EC\$30 per 1 kg.

In the case of sherbet, the cost is lower than ice cream as shown below. The cost to make 1 kg of sherbet was total EC\$ 27 for sugar, lemon, seamoss, and so on. Therefore, if it was sold at EC\$ 5 for 50g of sherbet, the profit would be EC\$ 100 per 1 kg by simple calculation.

However, it should be noted that these calculations do not include rental fees for sales floor facilities, transportation costs, fixtures. Further trials will be necessary in the future to establish a business model.

4. DISCUSSION

As mentioned above, each of the three pilot activities introduced has produced some results, but it is necessary to confirm the situation over a longer period to see if they have a sustainable and positive impact on the local community.

Regarding the co-management of Fish Aggregating Devices (FAD), the outcomes are generated based on the co-benefit between the improvement of fishers' livelihoods and fisheries management (Montes et al. 2017). To sustainably establish these mutually beneficial relationships, the following measures would be necessary:

- Establishment of fisherfolks' organizations and fishing regulations;
- Restriction of membership of fisherfolks' organizations to fisherfolks participating in the production and deployment of FADs regularly;
- Grant of benefits such as prioritized support of FAD fishing permits, participation in technical training related to fishing technology to fisherfolks who actively participate in FAD activities, comply with the regulations and submission of catch data;
- Establishment of ownership in fisherfolks through early participation and leverage their experience and knowledge; and
- Fostering of relationships of trust among fisherfolks.

In relation to lionfish removal, the 'lionfish tournament' held as part of the pilot activity was successful and well received. Andradi-Brown (2019) stated that since the invasion of lionfish into the Caribbean Sea, extermination by divers has had some effect, and that their population density has decreased, especially in shallow waters. On the other hand, he mentioned that most of the divers responsible for exterminating lionfish are volunteers, and if their efforts do not continue, it would be assumed that the population density of lionfish, which are prolific breeders, would rise again soon. Currently, many areas in the Caribbean have banned spearfishing using SCUBA to preserve coastal resources and ecosystems. In this context, offering lionfish spearfishing to tourists as a tourist attraction under the guidance of local diving instructors and guides can be expected to have a positive impact on both tourism operators' income and ecosystem conservation. Also, pertaining to the lionfish that have been exterminated, it may be possible to develop a new value chain by introducing lionfish dishes at restaurants for tourists. One of the restaurant chefs of resort hotels in St. Lucia has taken note of the lionfish's delicate, moist flavour and has introduced it to the tourist menu, and even has held cooking classes as one of the tourist attractions. It can be imagined that spreading this kind of initiative will have a positive impact on local restaurants as well. In the future, it would be

necessary to provide an explanation to resort hotels and restaurants about the benefits of purchasing lionfish and measures to communicate this to customers.

The trial of cultured seaweed products for tourism is still in its infancy, so we need to gain even more experience in the future. Since this project targets small-scale fish farmers, it might be important to accumulate good practices for business models suitable for such targets.

These pilot activities draw upon Japan's extensive experience in co-benefits, such as fisheries resource co-management, food value chains, and the concept of *satoumi*, which seeks to enhance production and biodiversity through harmonious human-nature interaction (Mizuta and Vlachopoulou 2017). The logic of the co-management is that the active participation of fisherfolks (community members) in fisheries management increases the effectiveness and efficiency of measures to solve problems. Since the challenge is to encourage participation through fisheries cooperatives, Japan's experiences in promoting coastal fishing through them is thought to be a valuable reference (e.g., Makino and Matsuda 2005, Makino et al. 2009). In Japan, under the fisheries regulation, fisheries cooperatives have been delegated the authority for fisheries management. Each fisheries cooperative provides rights to engage in fishing and necessary services (such as the use of fishing ports and landing facilities, supply of ice, fuel, and fishing gear, marketing of the catch through auctions, financing for vessel construction) to its members (Makino and Matsuda 2005). The members are usually limited to full-time fisherfolks residing in the community. It operates generally based on democratic principles, fulfilling responsibilities for fisheries management, including the establishment and compliance with fisheries regulations. In other words, fisherfolk receive the right to engage in fishing and necessary services through fisheries cooperatives, and in return, they assume the responsibility for fisheries management. This is an example of co-benefit between management of resources and improvement of livelihood.

As part of fisheries management, some fisheries cooperatives in Japan are responsible for regulating the use of coastal areas through zoning or utilization adjustments of fishing, aquaculture, ecosystem conservation, recreational fishing, diving, and others (e.g., Ike 2001, Ueda 2022). The concept of "*satoumi*" is an approach to improving seafood production and coastal biodiversity through the harmonious interaction between humans and nature and is rooted in the Japanese cultural background that emphasizes the coexistence of humans and nature (e.g., Berque and Matsuda 2013, Matsuda and Kokubo 2016). To make this a reality, it is important to form a consensus among local people to improve both productivity and biodiversity through human use of the natural environment. The examples of specific activities include water purification by cultivating shellfish and seaweed along the coast, establishment of nursery grounds in appropriate locations, creation of seaweed beds, installation of artificial reefs, and transplantation of corals to improve biodiversity. Efforts are being taken across Japan to balance utilization and conservation, such as increasing and strengthening marine resources. In many cases, such activities are carried out by the fishing cooperatives and local NPOs in cooperation with local governments. In some cases, ecological conservation costs are covered by tourism revenues such as sports fishing, diving and mooring of pleasure boats.

Conversely, in the long term, fisheries management and ecosystem conservation alone are not expected to be sustainable and effective. Such activities are unlikely to provide significant increases in catches or real stakeholder profits. Therefore, in order to ensure a stable supply of marine products and increase the income of fishermen, it is necessary to focus on making efficient use of the limited quantity of fish caught. This includes reducing post-harvest losses and increasing value addition. Specific measures include simple processing methods such as smoking, the development of cold chain infrastructure, the introduction of a hygiene control

system (HACCP), and the strengthening of both soft and hard aspects for export. Also, strong options include establishing local sales and direct shipping through initiatives such as fishermen's restaurants in conjunction with tourism and promoting food value chains. However, in implementing such activities, it is essential to obtain collaboration with the private sector, which will lead the activities. In St. Lucia, activities have been carried out in collaboration between the government, fisherfolks, diving tourism operators, restaurants, and other marine-related parties as mentioned above. These activities will be good examples that the tourism and fisheries industries work together to conserve the ecosystem and improve the livelihoods of those involved. It is believed that accumulating such cases is becoming increasingly important.

In the pilot activities, Japan's experiences with co-benefits, such as fisheries resource co-management, food value chains, and the satoumi, have been regarded as effective. To make use of the experiences and outputs of the pilot activities globally, it is crucial to structure them in a format that includes the necessary conditions for their successful implementation. Indeed, the evaluation of their effectiveness in other regions and feedback would be also important. In order to continue and further develop those knowledge sharing activities, a mechanism for collecting, organizing, accumulating, and sharing knowledge is considered effective.

In the context of the green economy, the toolbox and the Global Green Growth Knowledge Platform (GGKP) serves as a global network, established by the Global Green Growth Institute (GGGI), the Organization for Economic Co-operation and Development (OECD), the United Nations Environment Programme (UN Environment), and the World Bank. Over time, this consortium has grown to encompass a diverse array of Knowledge Partners, consisting of prominent institutions and organizations actively engaged in green growth and the green economy across local, national, regional, and international levels. In Japan, a specialized online knowledge database for small-scale coastal fisheries has already been established and is actively utilized by stakeholders, including fishers. In addition, Ministry of Agriculture, Forestry, and Fisheries sponsors annual national public presentation events that showcase representatives from successful groups of fishers (*Takemura et al. 2020*).

Utilizing these movements to their fullest potential, collaborative efforts with the Caribbean Regional Fisheries Mechanism (CRFM), governments, and donors, including JICA, are anticipated to foster knowledge sharing with formulation and accumulation of additional examples, thereby effectively promoting the blue economy.

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LITERATURE CITED

- Andradi-Brown, D. A. 2019. Invasive Lionfish (*Pterois volitans* and *P. miles*): Distribution, Impact, and Management. 931-941. in Y. Loya, K. A. Puglise, and T. C.L. Bridge (eds) *Mesophotic Coral Ecosystems*. Springer Nature, Switzerland.
- Berque, J. and O. Matsuda. 2013. Coastal biodiversity management in Japanese satoumi. *Marine Policy*, 39: 191-200.
- Beverly, S., D. Griffiths and R. Lee. 2012. Anchored fish aggregating devices for artisanal fisheries in South and Southeast Asia: benefits and risks. FAO Regional Office for Asia-Pacific. Bangkok. 37 pp.
- Cabral, R. B., P. M. Alino, and M. Lim. 2014. Modelling the impacts of fish aggregating devices (FADs) and fish enhancing devices (FEDs) and their implications for managing small-scale fishery. *ICES Journal of Marine Science*, 71(7): 1750–1759.
- Côté I. M., S. J. Green, and M. A. Hixon. 2013. Predatory fish invaders: Insights from Indo-Pacific lionfish in the western Atlantic and Caribbean. *Biological Conservation*, 164: 50-61.
- FAO. 2012. Anchored Fish Aggregating Devices (FADs) for Artisanal Fisheries. FAO. Rome. 4 pp.
- Ike, S. 2001. Change of the community due to the introduction of scuba diving in Futo, Ito City (In Japanese). *Shin Chiri*, 48(4): 18-37.
- JICA. 2012. Study on the Formulation of a Master Plan on the Sustainable Use of Fisheries Resource for Coastal Community Development in the Caribbean: Final Report. Japan International Cooperation Agency, Tokyo. 153 pp.
- Layman, C. A. and J. E. Allgeier. 2012. Characterizing trophic ecology of generalist consumers: a case study of the invasive lionfish in The Bahamas. *Mar. Ecol. Prog. Ser.*, 448: 131–141.
- Makino, M. and H. Matsuda. 2005. Co-management in Japanese coastal fisheries: Institutional features and transaction costs. *Marine Policy*, 29(5):441-450.
- Makino, M., H. Matsuda and Y. Sakurai. 2009. Expanding fisheries co-management to ecosystem-based management: A case in the Shiretoko World Natural Heritage area, Japan. *Marine Policy*, 33(2): 207-214.
- Matsuda, O., and H. Kokubo. 2016. Reprint of Recent coastal environmental management based on new concept of Satoumi which promotes land-ocean interaction: A case study in Japan. *Estuarine, Coastal and Shelf Science*, 183: 422-429.
- Mikuni, N. 2017. International cooperation by JICA in the area of fisheries managements: Current state and future possibilities, in the consideration of the experiences of co-management project in the Eastern Caribbean region.(In Japanese). *Nippon Suisan Gakkaishi*, 83(6), 1022.

Mizuta, D. D. and E. I. Vlachopoulou. 2017. Satoumi concept illustrated by sustainable bottom-up initiatives of Japanese Fisheries Cooperative Associations. *Marine Policy* Vol. 78: 143-149.

Montes, N., M., C. Sidman, K. Lorenzen, M. Honda, M. Tamura, and M. Ishida. 2017. Co-management of FAD fisheries: A socio-economic analysis of offshore fishers residing on CARIFICO member islands. Florida Sea Grant, Gainesville. 68 pp.

Morris, J. A. Jr., C. V. Sullivan, and J. J. Govoni. 2011. Oogenesis and spawn formation in the invasive lionfish, *Pterois miles* and *Pterois volitans*. *Scientia Marina*, 75(1): 147-154.

Phang, S., A. March, G. Tournon-Gardic, K. Deane, P. Failler, and A. Notes. 2023. A review of the blue economy, potential, and opportunities in seven Caribbean nations pre-COVID-19. *ICES Journal of Marine Science*, 0: 1–11.

Ruiz-Carus R., R. E. Matheson Jr., D. E. Roberts Jr., and P. E. Whitfield. 2006. The western Pacific red lionfish, *Pterois volitans* (Scorpaenidae), in Florida: Evidence for reproduction and parasitism in the first exotic marine fish established in state waters. *Biological Conservation*, 128: 384-390.

Rustomjee, C. 2016. Developing the blue economy in Caribbean and other small states. *CIGI Policy Brief*, 75: 1-6.

Smith, A. H. 1997. Seamount cultivation in the West Indies. CANARI-Guideline-Series-1. Caribbean Natural Resources Institute, Saint Lucia. 23 pp.

Smith, A. H. and Y. Renard. 2002. Seaweed cultivation as a livelihood in Caribbean coastal communities. Paper presented at the ICRI Regional Workshop for the Tropical Americas: Improving Reefs Condition Through Strategic Partnerships. Cancun, Mexico, June 2002. CANARI Communication, 309:8 pp.

Takemura, S., M. Makino and H. Tajima. 2020. Self-Assessment Scheme to Improve the Management of Coastal Fisheries: the Case of Applying to the Revision of the “Seashore Revitalization Plan” in Shimonoseki-Gaikai Region, Yamaguchi, Western Japan. (in Japanese). *Journal of regional fisheries*, 60(3): 125-136.

Tamura, M., M. Ishida, C. Sidman, N. Montes, and K. Lorenzen. 2018. Facilitating Co-managed Fisheries in the Caribbean Region: Good Practices and Guidance from the CARIFICO Experience. Florida Sea Grant, Gainesville. 28 pp.

Ueda F. 2022. Conflicts between Diving-business and Fishery Co-operatives at Coastal Fishing Ground in Miyakojima Island (OKINAWA) (in Japanese). *OKIDAI KEIZAI RONSO*, 19(1): 27-72.