21 Initiatives to Restore Aioi Bay (Aioi City)

Kansai

The City of Aioi, the Aioi Bay Nature Restoration Study Conference, and the Aioi Crab Brothers, all work together in their respective areas of expertise to protect and nurture the precious nature of Aioi's sea through environmental education.

Overview

- Organizing "Satoumi Club" for elementary school students to learn about the natural wonders of the sea in their hometowns
- Eelgrass transplantation project centered on the Aioi Bay Nature Restoration Study Conference
- The Aioi Crab Brothers, two local brothers, have been conducting ecological surveys of crabs living in the sea of Aioi almost every week since they were in elementary school

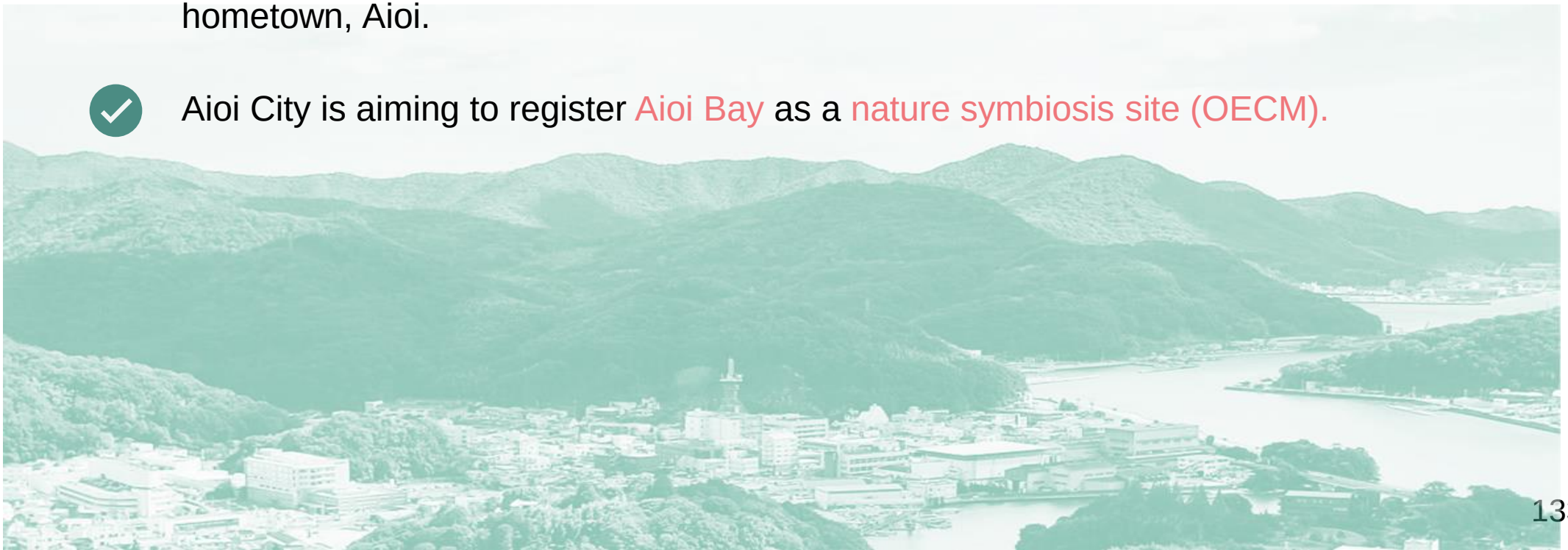
Exploration of Owan Island

Basic Information

Region	Aioi City
Participating organizations	Aioi City, Aioi Bay Nature Restoration Study Conference, Aioi Crab Brothers cooperate
Start year	2004 Aioi City started an environmental education focusing on the sea
Contents of activities	• Environmental education and public awareness • Seeding and transplanting of eelgrasses
Site area	0.6ha
Amount of CO2 absorption	0.11t-CO2 (MOE, FY2022 Survey of seagrass/seaweed beds and tidal flats distribution and amount of CO2 absorption : 0.11t-CO2)

Initiatives to Restore Aioi Bay

- Aioi City has been conducting environmental conservation activities for nearly 20 years in cooperation between the private and public sectors for the revitalization of Aioi Bay.
- Aioi City, the Aioi Bay Nature Restoration Study Conference, and the Aioi Crab Brothers cooperate in their activities, each exerting their strength in their respective fields of expertise.
- They are all working to give back to "Aioi Bay," which taught them the beauty of their hometown, Aioi.
- Aioi City is aiming to register Aioi Bay as a nature symbiosis site (OECM).



Aioi City Initiatives

[Overview of Activities]

◇Evolution of the Activities

- In 2004, Aioi City started an environmental education focusing on the sea.
- In 2010, the theme of the environmental education was set as "Satoumi creation," and 20 elementary school students were selected as the "Satoumi Club" as the main target of the education program.
- In addition, Aioi City supports environmental educations conducted by third-graders from the schools adjacent to the bay, together with the fishery cooperative.


Exploration of Owan Island

◇ Purpose and Objectives of Activities ◇

By exposing children to the sea of their hometown from various perspectives, they will develop an interest in, familiarity with, and attachment to the sea and learn about the natural wonders of the sea in their hometown.

In the process, each child will think about **how to protect and nurture the precious nature** of Aioi Bay.

Content of Satoumi Club Activities

- The activities of the Satoumi Club are carried out in cooperation with the Aioi Harimanada Satoumi Creation Council and the Aioi Crab Brothers, with Aioi City serving as the secretariat and consisting of the Aioi Bay Nature Restoration Study Conference, B&G Aioi Marine Club, Aioi Bay Yacht Club, Aioi Fishing Cooperative Association and other coastal companies.
- Environmental education programs are held about 10 times a year throughout the year.

◊ Satoumi Club Annual Schedule of Activities ◊

No.	Schedule	Name of Activity
1	Jun	Biological survey by bottom trawling, Offshore Aioi Bay
2	Jul	Release juvenile flounder fish along with beach cleanups
3	Jul	Collecting creatures by lamplight (mainly insects)
4	Jul	Summer plankton research
5	Aug	Karanishima Island Tidal Level Experience (by boat)
6	Aug	Survey of tidal flat organisms (in Nose)
7	Aug	Exploration of Owan Island (by boat)
8	Oct	Naba Port Goby Fishing Tournament
9	Oct	Autumn plankton research and eelgrass seeding
10	Nov	Hyogo Museum of Nature and Human Activities study session (by bus)
11	Dec	Survey of organisms living with oysters
12	Feb	Aioi City Children's Environment Conference


Iwashihama coastal cleanup, Release juvenile flounder fish


Survey of organisms living with oysters

◊History of Awards, etc.◊

Recognition of Excellent Marine Environmental Education Experiential Activity: Marine Environmental Education (FY2019)

Aioi Bay Nature Restoration Study Conference Initiatives

【Overview of the Organization】

- Established: FY2004, Representative: Shinsaku Matsumura

【Overview of Activities】

◇ Purpose and Objectives of Activities ◇

- Aiming to restore the sea where Japanese horseshoe crabs used to live
- Through these activities, we aim to teach the children of Aioi about the connection between Aioi Bay, the Harimanada Sea, the Seto Inland Sea, the Pacific Ocean, and the world's oceans, while tackling environmental problems in the sea around us.

◇Content of Activities◇

1) Eelgrass transplantation project
2) Protection and preservation of "Shibana," a natural monument of Aioi City
3) Coastal cleanup
4) Environmental education

◇ Eelgrass transplant project (2014-) ◇

■ Content of Activities

- Environmental education for third graders of two elementary schools in the coastal area of Aioi Bay, and with participants of the Satoumi Club activities conducted by Aioi City.
- There are two ways to increase eelgrass: sowing seeds in the sea or growing seedlings in an artificial environment and returning them to the sea.

■ Eelgrass performance (FY2022)

- As a result of our activities, we confirmed growing areas in three locations in Aioi Bay.

◇History of Awards, etc.◇

Minister of the Environment Award, for distinguished service to regional environmental conservation and environmental conservation (June 2022)


Karanishima Island Tidal Level Experience


Eelgrass seedlings in pots


Seed sowing


Seed sowing

Status of eelgrass in Aioi Bay (FY2022)

Activity area	Coverage Classification	Cover degree	Area(㎡)	Amount of CO2 absorption (tCO2/year)
Activity area A	Low density	2	1,750.90	0.05
	Very low density	1	2,026.10	0.03
Activity area B	Very low density	1	780.8	0.01
Activity area C	Very low density	1	1,675.10	0.02
Total amount				0.11

A:In front of the Peiron Castle (Dragon Boat Castle)
B:In front of the Peiron Kaikan (Dragon Boat Hall)
C:Deepest part of the Naba-port

Source：MOE, FY2022 Survey of seagrass/seaweed beds and tidal flats distribution and amount of CO2 absorption

Initiatives by Aioi Crab Brothers

【Overview of the organization】

- Established in 2015, Members: Hitohiro Osumi, Ryoto Osumi


Aioi Crab Brothers


Ecological surveys

【Overview of Activities】

◇ Opportunity for Activities ◇

- In 2015, two brothers, who were in first and second grade at the time, participated in a mud flat observation event organized by the city and were fascinated by "crabs".
- Since then, they started research with curiosity about how many species of crabs exist in the sea of their hometown.

◇Content of Activities◇

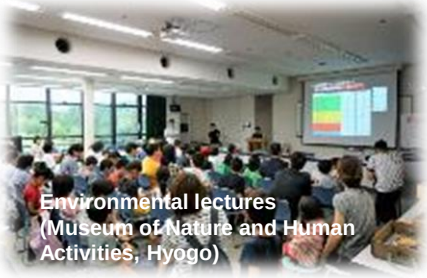
- Ecological surveys by going to the sea in Aioi almost every weekend.
- Currently, 81 species of crabs have been discovered, including Hyogo Prefecture's endangered species and species that were first discovered in Hyogo Prefecture. They have also discovered valuable living creatures such as beach plants, shellfish, and birds.
- Creating crab specimens, recording crab conditions, and writing papers. Presenting their research at crustacean society and widely across Hyogo Prefecture and outside.
- They are currently writing a "Crab Encyclopedia" of Aioi Bay
- They also serve as instructors at biological observation meetings, discovering and communicating the appeal of the sea in their hometown.


Red-clawed crab

◇History of Awards, etc.◇

- Special Encouragement Award, 55th Annual Meeting of the Crustacean Society of Japan
- Japan Nature Conservation Award 2021, Children and Students Category
- Grand Prize, Kids Supporter of the Sea 2022, etc.


Biological observation meetings


Environmental lectures (Museum of Nature and Human Activities, Hyogo)

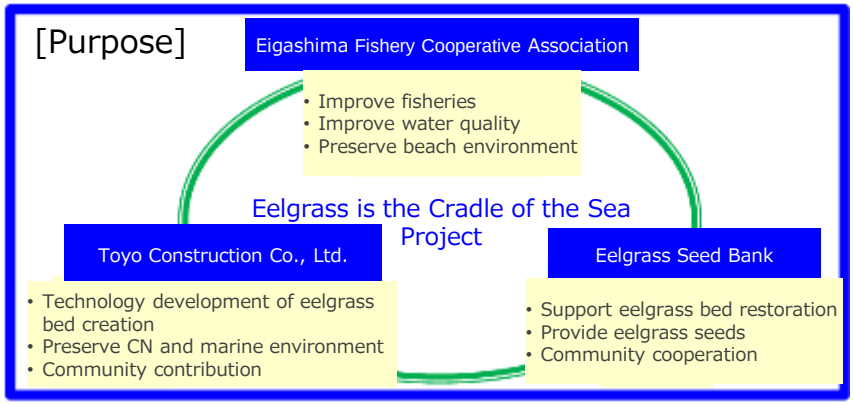
22 Project to create eelgrass beds around Eigashima, Akashi City (Eigashima Fishery Cooperative Association)

Kansai

Improvement of water quality and preservation of the coastal environment through seafloor and beach cleanup activities, creation and restoration of eelgrass beds using seeding sheets, and survey of eelgrass bed habitat organisms using seine nets.

Overview

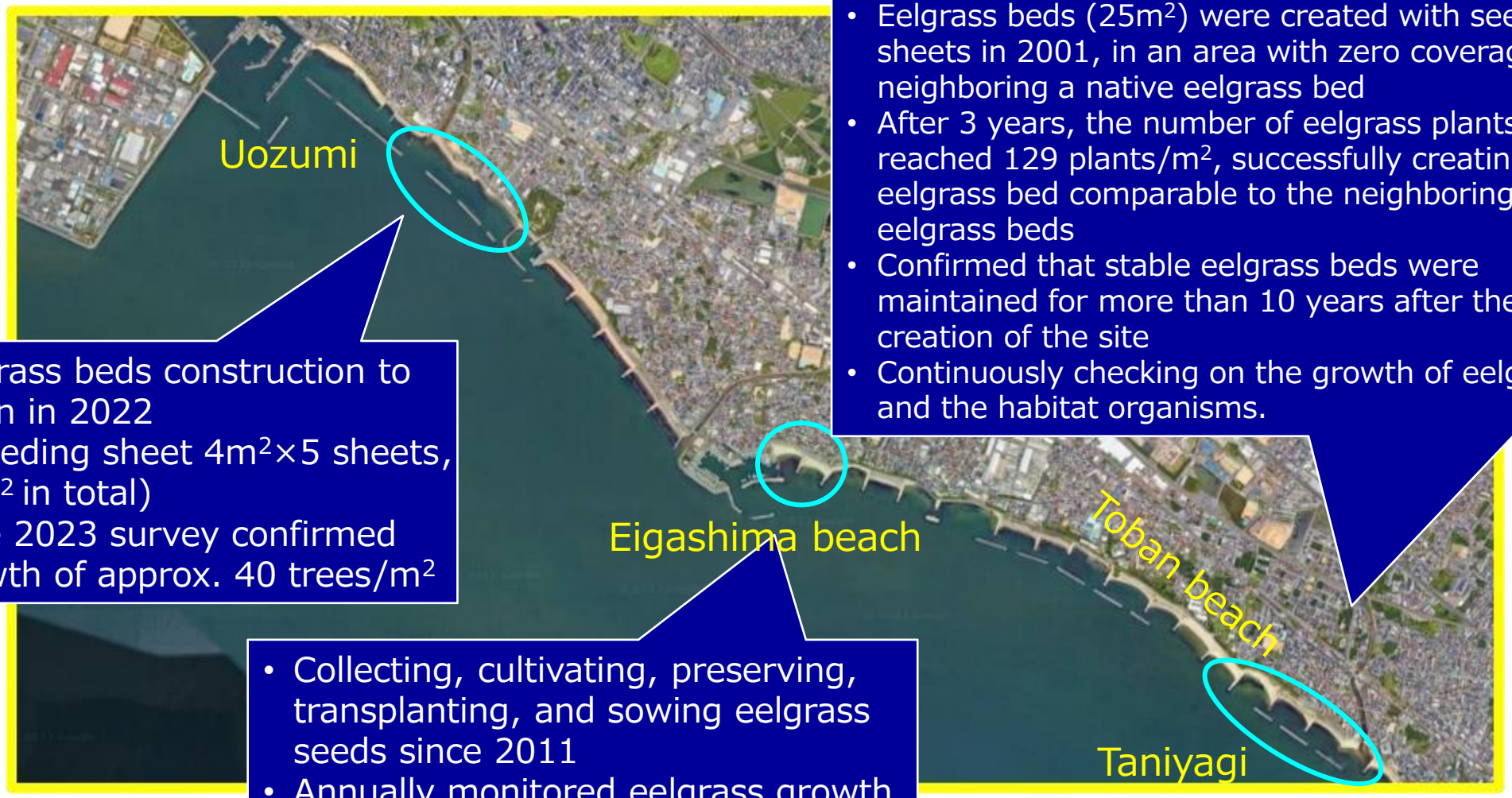
- Improving water quality and preserving the coastal environment by cleaning up the seafloor using bottom trawlers and conducting sea cleanup activities along the coast.
- Creating and rehabilitating eelgrass beds by laying out seeding sheets made of biodegradable non-woven fabric and coconut mats on the seafloor.
- Conducting a habitat survey of the eelgrass beds using seine nets, while removing harmful organisms to conserve eelgrass beds.



Basic Information

Region	Akashi City
Participating organizations	Eigashima Fishery Cooperative Association, Toyo Construction Co., Ltd.(Naruo Research Institute and Osaka Main Office),NPO Eelgrass Seed Bank
Start year	2001
Contents of activities	• Seeding of seaweeds and transplanting of sporophyte • Beach clean-up
Site area	—
Amount of CO2 absorption	6.4t-CO2 (J Blue Credit, FY2022:6.4t-CO2)

Activities



- Eelgrass beds construction to begin in 2022
  (Seeding sheet 4m^2×5 sheets, 20m^2 in total)
- June 2023 survey confirmed growth of approx. 40 trees/m^2

- Collecting, cultivating, preserving, transplanting, and sowing eelgrass seeds since 2011
- Annually monitored eelgrass growth and species inhabiting the area
- SDGs initiative “Cradle of the Sea Classroom Centered on Children” was implemented

- Eelgrass beds (25m^2) were created with seeding sheets in 2001, in an area with zero coverage, neighboring a native eelgrass bed
- After 3 years, the number of eelgrass plants reached 129 plants/m^2, successfully creating an eelgrass bed comparable to the neighboring native eelgrass beds
- Confirmed that stable eelgrass beds were maintained for more than 10 years after the creation of the site
- Continuously checking on the growth of eelgrass and the habitat organisms.

Implementer (i) Eigashima Fishery Cooperative Association

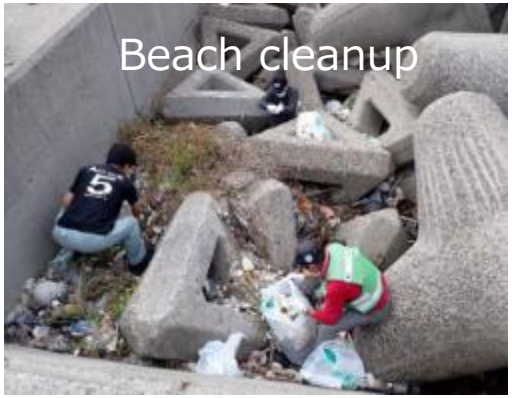
Location	418-6 Eijima, Okubo-cho, Akashi City, Hyogo Prefecture
Main fishing industry	Nori aquaculture, small otter trawl fishing, single line fishing
Number of fishermen	80 fishermen
Characteristics	• The predecessor of Uozumi-no-Tomari was established in 744 by the monk Gyoki as one of the five harbors of the Seppan Gohaku domain. • The Harimanada Sea in the area is one of the richest fishing grounds in Japan, with shallow waters created by the violent currents of the Akashi Strait.
Keywords	Akashi sea bream, Akashi octopus
Main SDGs activities	・Conservation of eelgrass beds and seaweed beds ・Marine cleanup, coastal cleanup ・Sea bottom cultivation, Pond Draining ・Visiting lectures (seine netting, dried octopus making, octopus pot making)


Drawnet


Making octopus pots


Making dried octopus


Eelgrass seed collection at Eigashima Beach

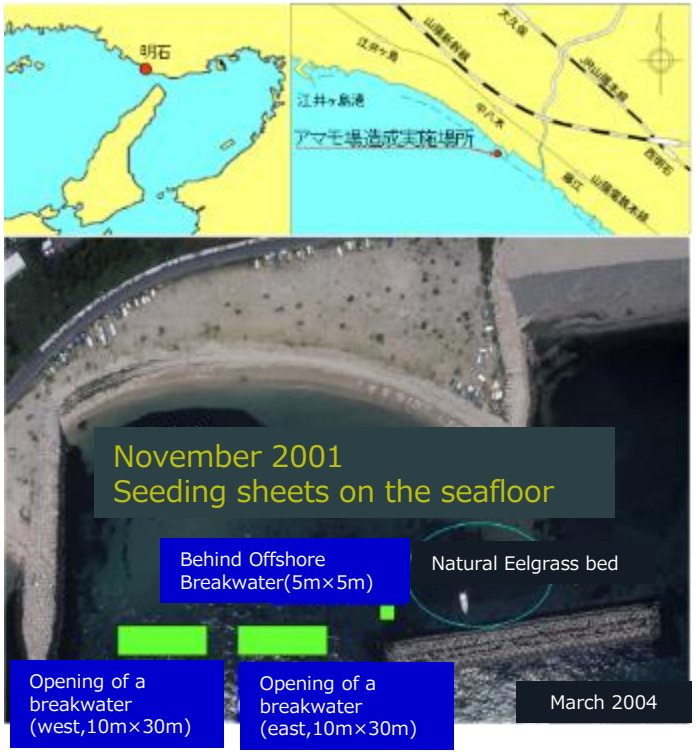

Beach cleanup


Sea bottom cultivation and marine cleaning

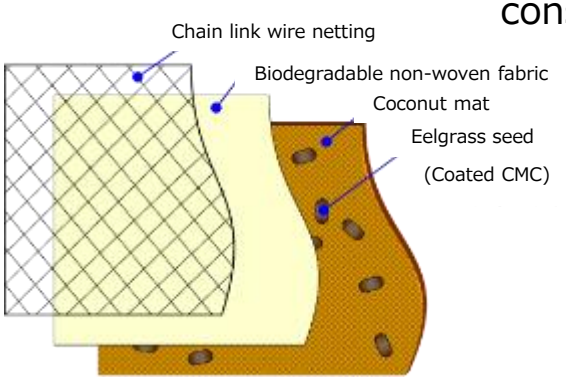

Pond Draining

Implementer (ii) Toyo Construction Co., Ltd.

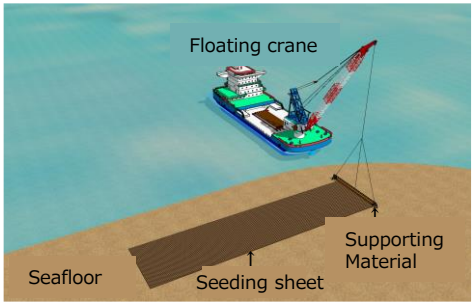
Location	(Head Office)Jinbocho Mitsui Building 1-105, Kandajinbocho, Chiyoda-ku, Tokyo (Technical Research Institute, Naruo) 1-25-1 Naruohama, Nishinomiya-shi, Hyogo (Osaka Main Office) 4-1-1 Kouraibashi, Chuo-ku, Osaka-shi, Osaka
Established	1929 Establishment of Hanshin Harbor Construction Co., Ltd. with joint-funding by the South Manchuria Railway and Yamashita Kisen (Yamashita Steamship) Co., Ltd. for the purpose of reclaiming a site fronting on Naruo, Nishinomiya City, Hyogo Pref. and constructing an industrial harbor. 1964 Trade name changed to Toyo Construction Co., Ltd.
Main activities	Construction(Marine&Civil Engineering, Building Construction)
Employees	1,521 (Technical staff 1,202, Office staff 319) (As of April 1st, 2022)
Main technologies for aquatic	• **Eelgrass bed creation using seeding sheets** • **Artificial tidal flat creation using biodegradable sheets** • **REAL Blocks, the best substrate for seaweed nurseries**



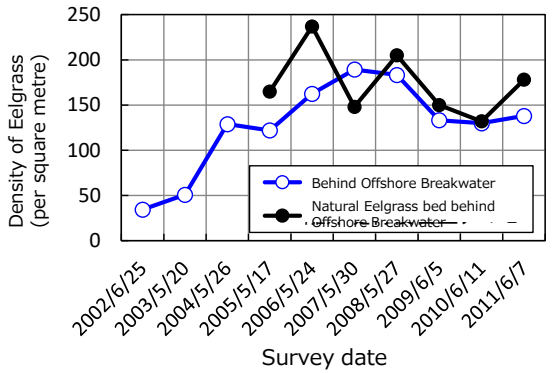
[Configuration of seeding sheets]



[Image of large-scale seeding sheet construction]

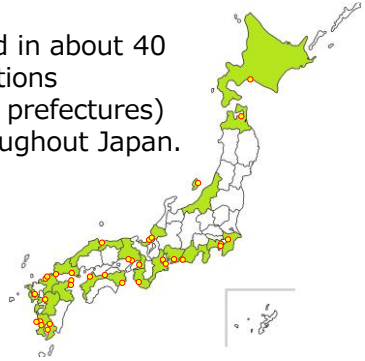


[Seeding sheet test results]



[Seeding sheet adoption results]

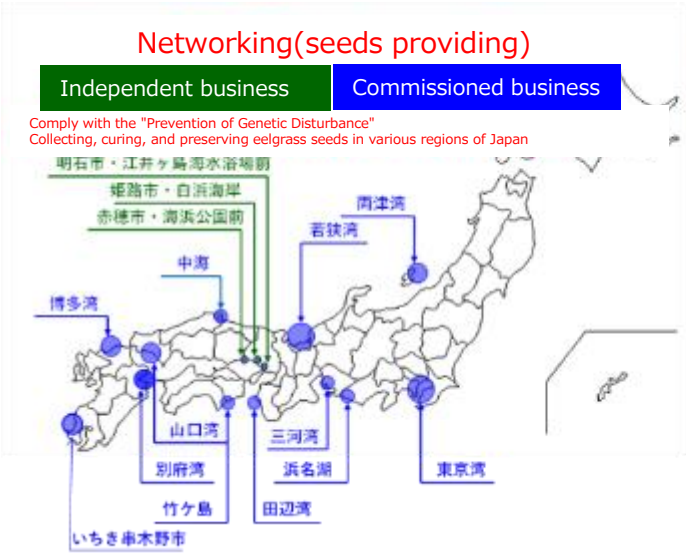
Used in about 40 locations (22 prefectures) throughout Japan.



Implementer (iii) Eelgrass seed bank (nonprofit organization)

Location	1-1-8, Naruohama, Nishinomiya City, Hyogo Prefecture
Established	2002
Purpose of establishment	• **Established for the purpose of collecting and storing seeds necessary for the regeneration and creation of eelgrass beds, and providing the necessary quantity when needed*1** • **Also conducting restoration and subsidized projects under direct management as needed.** • **In collaboration with local citizen groups in each region, conducting a series of eelgrass bed restoration activities, including seed collection, sowing, cultivation, and transplantation of eelgrass seedlings, as a hands-on environmental learning experience for children or as a community revitalization project for local residents.**
Main activities	• **Collecting, curing, and preserving eelgrass seeds in various regions of Japan, including Akashi, Hakata Bay, Nakaumi, and Ooi Town.** • **Nagisa Kaido Eelgrass bed Restoration Project: Eelgrass bed restoration activities as part of environmental experience learning at elementary schools in cooperation with citizen groups in Harimanada, Osaka Bay, and Kishu Nada (Ako, Aioi, Himeji, Akashi, Kobe, Nishinomiya, Izumisano, Sennan, Hannan, Tanabe)** • **Natural regeneration of urban rivers linking forests, rivers, and the sea: Kobe City, creation of seaweed beds at the mouth of the Sumiyoshi River, etc.**

*1 : Comply with the "Prevention of Genetic Disturbance" of the "Considerations for Restoration of Seagrass beds" (Ministry of the Environment, March 2004) and the "No-transfer line of eelgrass seedlings based on genetic diversity" of the "Guidelines for Natural Restoration of Eelgrass (Fisheries Agency and Marino Forum 21, March 2007).



Nagisa Kaido Eelgrass bed Restoration Project


Collecting eelgrass seeds


Sowing eelgrass seeds


Transplanting eelgrass seedlings

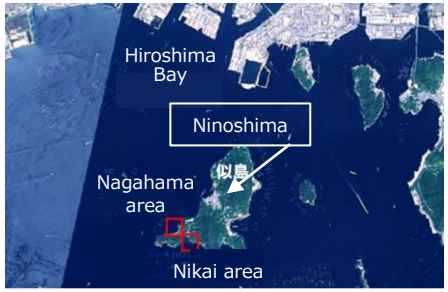
23 Blue Carbon Initiatives (The City of Hiroshima)

Chugoku & Shikoku

Expansion and maintenance of seaweed beds by transplanting eelgrass and installing seaweed bed blocks.

Overview

- Artificial tidal flats were created by the Ministry of Transportation (the current Ministry of Land, Infrastructure, Transport and Tourism) in the Nagahama area of Ninoshima Town, Minami-ku, Hiroshima City, and by the Hiroshima City Fisheries Cooperative Association in the Nikkai area of Ninoshima Town, Hiroshima City, creating conditions for the growth of eelgrass, including light and bottom sediment environments.
- Using the proceeds from J Blue Credits, activities to expand and maintain seaweed beds were carried out by installing seaweed bed blocks.



Basic Information

Region	Hiroshima City
Participating organizations	Hiroshima City Fisheries Cooperative Association, the City of Hiroshima
Project starting period	FY1987, FY1989 Artificial tidal flat completed Surveys begin in FY2021 on area of seaweed beds and amount of CO2 absorption
Primary activities	• Seeding of seaweeds and transplanting of mother algae • Improvement of water quality (oyster farming) • Sand covering and water depth adjustment (creation of artificial tidal flats)
Site area	4ha (Nikai area: 1ha, Nagahama area: 3ha)
Amount of CO2 absorption	2.4t-CO2 (J Blue Credit, FY2022: 2.4t-CO2, Nikai area)

Blue Carbon Initiatives (The City of Hiroshima)

Overview

- Over the Meiji, Taisho, and Showa eras, Ninoshima Island was used as a quarantine station for wounded and exhausted soldiers returning home from overseas battlefields. Immediately after the atomic bomb was dropped, the quarantine station became a temporary field hospital where about 10,000 wounded soldiers were transported. The island is still dotted with remnants and historical sites from the past. It is a place where visitors can the feel firsthand horror and tragedy of war and the atomic bombing, as well as the preciousness of peace.

- In 1987, the Ministry of Transport created artificial tidal flats in the Nagahama area, located in the western part of the island. In 1989, the Hiroshima City Fisheries Cooperative Association created artificial tidal flats in the Nikai area, located in the southwestern part of the island, thus creating the conditions for eelgrass growth, including light and bottom sediment environments.
- Subsequently, in the Nagahama area, the City of Hiroshima installed seaweed bed blocks, and in the Nikai area, transplanted approx. 5,000 m² of eelgrass, and the Hiroshima City Fisheries Cooperative Association installed seaweed bed blocks and oyster culture control racks, which have helped purify the water quality and promote eelgrass growth.

Blue Carbon Initiatives (The City of Hiroshima)

Examples of Initiatives

■ **FY2021**

- The City of Hiroshima conducted a survey on the area of seaweed beds and the amount of carbon dioxide absorbed in the 1 ha area of the Nikai area.

■ **FY2022**

- The City of Hiroshima and the Hiroshima City Fisheries Cooperative Association jointly applied to JBE for certification of J Blue credits for the Nikai area, and the amount of carbon dioxide absorbed was certified as 2.4 tons.
- The certified J Blue Credits were traded between the four JBE publicly solicited companies and the Hiroshima City Fisheries Cooperative Association.
- The City of Hiroshima conducted a survey of approx. 3 ha in the Nagahama area in addition to the Nikkai area.

■ **FY2023**

- The City of Hiroshima and Hiroshima City Fisheries Cooperative Association plan to jointly apply to JBE for certification of J Blue Credits for the Nikai and Nagahama areas.


Diving survey


Aerial drone


Aquatic drone

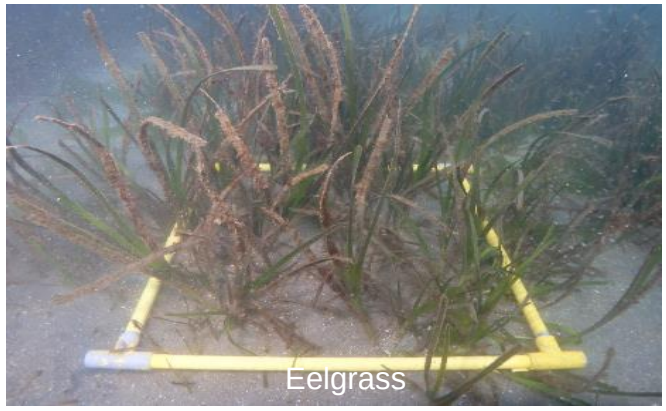

Underwater drone

Blue Carbon Initiatives (The City of Hiroshima)

Initiative Characteristics

- Initiatives that contribute to the achievement of a decarbonized society by using the proceeds of J Blue Credits to expand and maintain seaweed beds will be implemented through the **installation of seaweed bed blocks.**
- Seaweed bed preservation activities not only help to reduce global warming by absorbing CO2, but also **enrich the Seto Inland Sea**, which has abundant marine resources, by providing a habitat for countless fish and crustaceans.
- In the future, initiatives will be implemented to **raise public awareness** in citizens and businesses.


Oyster culture control racks


Eelgrass


Seaweed bed blocks

24 Creating Sato-umi※ through the Restoration of cradle of the Onomichi Sea (Onomichi City)

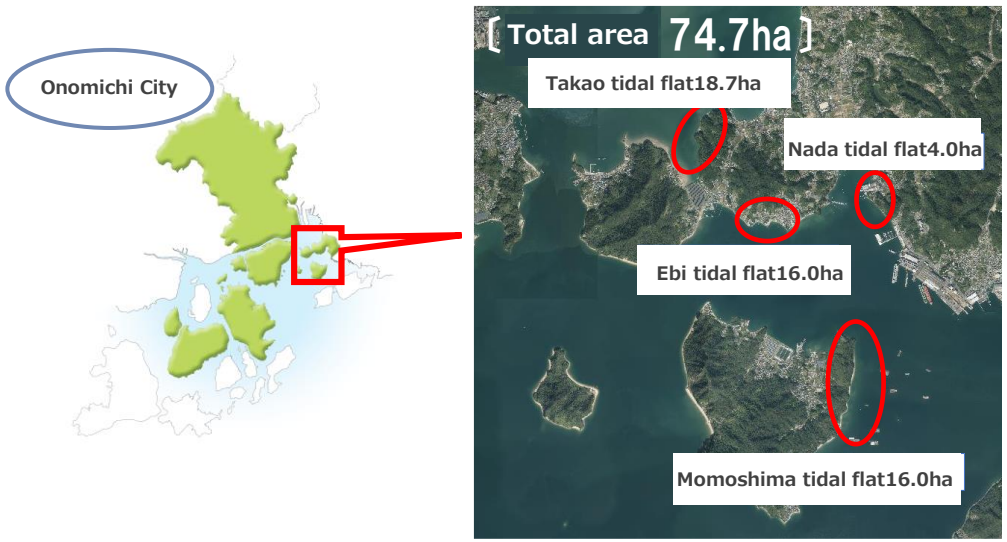
(※Sato-umi is a coastal area where biological productivity and biodiversity has increased through human interaction.)

Chugoku & Shikoku

Continuing conservation and restoration activities on the four artificial tidal flats created and aiming to revitalize the region with Blue Carbon as a basic point.

Overview

- From 1984 to 2020, the Ministry of Land, Infrastructure, Transport and Tourism created tidal flats using dredged sediment, and after the artificial tidal flats were created, local fishermen and Onomichi City continuously created tidal flats and seaweed beds through activities such as conservation of habitats and cleaning.
- Aiming to revitalize the region with blue carbon as a basic point, through cooperation with initiatives to promote marine sports, called "Onomichi Kaizoku," as well as the maritime and tourism industries.



Basic Information

Region	Onomichi City
Participating organizations	Urashima Fishery Cooperative, Onomichi City
Start year	1984
Contents of activities	• Improvement of water bottom quality(Cultivation) • Beach clean-up • Sand covering and water depth adjustment
Site area	75ha
Amount of CO2 absorption	130.7t-CO2 (J Blue Credit,FY2022:130.7t-CO2)

Initiatives in Onomichi City

Urashima Fishery Cooperative

Tidal flats conservation and restoration activities
(Fishery multifunctionality project)

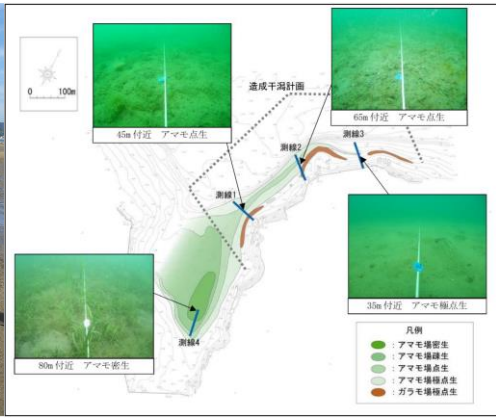

〔 Collection of young shellfish 〕


〔Cultivation〕


〔 Replacement of nets to prevent feeding damage 〕

MLIT Chugoku Regional Development Bureau

(Environmental survey of tidal flats)



Onomichi City

Acquired J Blue Credit Certificat

Food supply	Clam production by tidal flats Increase of 10 tons per year Japanese red seaperch production by seaweed bed Increase of 7 tons per year
Water purification	Amount of COD purification by organisms in tidal flats and seaweed beds Increase of 74 tons per year

★Economic value★ Approx. $937,000/yr

(estimated by Market Price Method and Replacement Cost Method)

Future Development

In the future, the local fishery cooperative and Onomichi City will continue these activities to restore tidal flats and seagrass beds, while aiming to revitalize the region with blue carbon as a basic point through cooperation with the "Onomichi Kaizoku“, maritime affairs and tourism industries.

Ongoing

Urashima Fishery Cooperative: Conservation activities
Onomichi City: J Blue Credit application

Profits

Aiming for a long-term business, using profits from the sale of J-Blue credits

Public Offering by JBE

J Blue Credit Sales Promotion
(Favorable to companies in the city, etc.)

Environmental Education and Seminars “Sowing of eelgrass seeds”

Source : Guidelines for seagrass restoration:, Fisheries Agency and Marino Forum 21
https://www.mf21.or.jp/pdf/amamo/guideline.pdf

Continuing environmental learning in local elementary schools and junior highschools

Environmental lectures

25 Blue Carbon Technology Development through Industry-Government-Academia Collaboration (Tromso Corporation)

Chugoku & Shikoku

Development of blue carbon technologies necessary to promote a sustainable blue economy through industry-government-academia collaboration.

Overview

- Conducting complex technological verification by bringing together a wide variety of companies with their own technologies and making an impact on the local economy.
- In collaboration with the government and academia, we are conducting a verification experiment on improving the implantation rate by controlling the flow of submarine soil on Innoshima Island.

Applying the Straw grids method of desert greening technology to marine greening

Basic Information

Region	Onomichi City
Participating organizations	Tromso Corporation, Toray Industries, Inc., NIKKEN KOGAKU co.,ltd., Chugai Technos Corporation, HIROGIN area design Co. Ltd., Fukuyama University, Hiroshima Prefecture, Onomichi City
Start year	2022
Contents of activities	• Adjustment of external forces (waves, currents) (PLA tubes) • Technology development (prevention of ocean acidification, improvement of species implantation rate, nutrient supplementation, measurement of CO2 fixation)
Site area	0.006ha
Amount of CO2 absorption	–

Implementation System of Initiatives

Implementation System of Initiatives
Industry-Government-Academia

Industry
Open innovation
(demonstration experiment field)

- 株式会社トロムソ TROMSO CO., LTD.
- TORAY Innovation by Chemistry
- いのちをつくるコンクリート 日建工学株式会社
- 中外テクノス
- ひろぎん エリアデザイン

Government
(National/local government/city /fishery cooperative)

尾道市 ONOMICHI CITY

Agriculture, Forestry and Fisheries Division

Environmental Policy Section

Coordination (permission/approval)

Ministry of Environment(Hiroshima Office)

Eastern Office of Construction, Hiroshima Prefectural Government

Agriculture, Forestry and Fisheries Bureau,. Hiroshima Prefectural Government

Japan Coast Guard

Innoshima City Fisheries Cooperative

Academia
(Expanding a research topic)

福山大学 FUKUYAMA UNIVERSITY
生命工学部 Faculty of Life Science and Biotechnology

Prof. Yamagishi

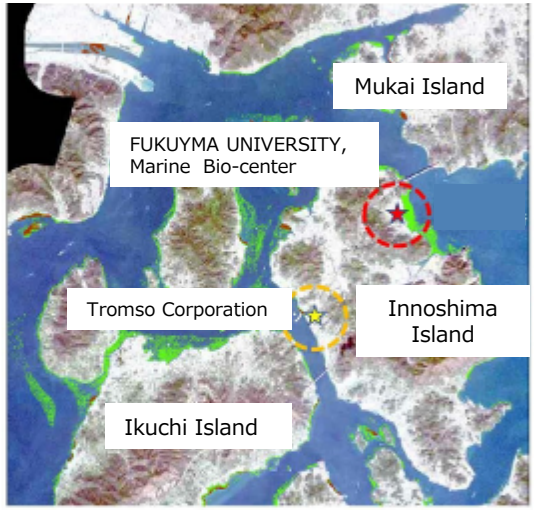
Job Title	Professor
Degree	Doctor of Science
Field of expertise	Algal Taxonomy

Prof. Kaneko

Job Title	Professor
Degree	Doctor of Agriculture
Field of expertise	Fisheries biology and ecology, biological oceanography

Joint Research Centre

Fukuyama university and Tromso corporation launch joint research collaboration towards the eelgrass bed creation(July 2022)



Innovation Promotion Team, Commerce, Industry and Labor Bureau, Hiroshima Prefecture
Commercialization Support

Initiatives

Multiple technology verification by diverse companies bringing their own technologies

1. Biochar

株式会社トロムソ TROMSO CO., LTD.

Reduction of acidification and soil improvement through marine use of rice husk biocarbon, which is attracting attention in agriculture.

Rice briquettes

Carbonized rice husk briquettes

2. Seed implantation rate

"TORAY" Innovation by Chemistry

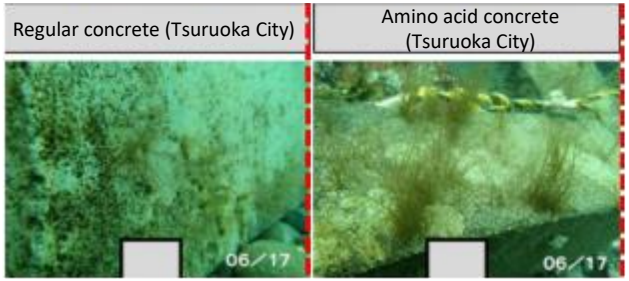
Research on the use of desert greening technology in the ocean to suppress the flow of submarine soil, improve the rate of seed implantation, and use as a vegetation base material

Collaborative research with Tottori Uni.

3. Nutritional supplementation

いのちをつくるコンクリート 日建工学株式会社

Research on the application of amino acids, which have been shown to promote the growth of seaweeds, to the cultivation of eelgrass



Collaborative research with Tokushima Uni.

4. Seaweed beds research

中外テクノス

Research on methodologies required for seaweed bed surveys and credit calculations using underwater and aerial drones

仕様表(空中ドローン)	
機体	Phantom 4 Pro
対角寸法	350mm（プロペラ含まず）
重量	1.375kg（バッテリー、プロペラを含む）
出力	静止画：JPEG　動画：MP4

仕様表(水中ドローン)	
機体	CHASING M2 PRO
本体サイズ	480×267×165mm
重量	6.7kg
最大深度	150m
最大対応	2m/s
航続時間	最大4時間
移動方向	360° 全方位移動 前進後退/左右平行移動/浮上潜水/パン・チルト
作動温度	-10℃～45℃
解像度	2×2200万
出力	静止画：JPEG　動画：MP4

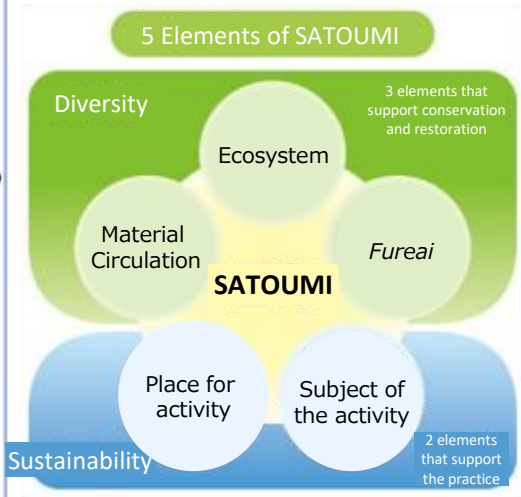
(Drone specs)

Impacts on local economy (involving financial institutions)

5. Cooperating with the region to create SATOUMI

未来を、ひろげる。 HIROGIN HOLDINGS

ひろぎんエリアデザイン



(Ministry of Environment)

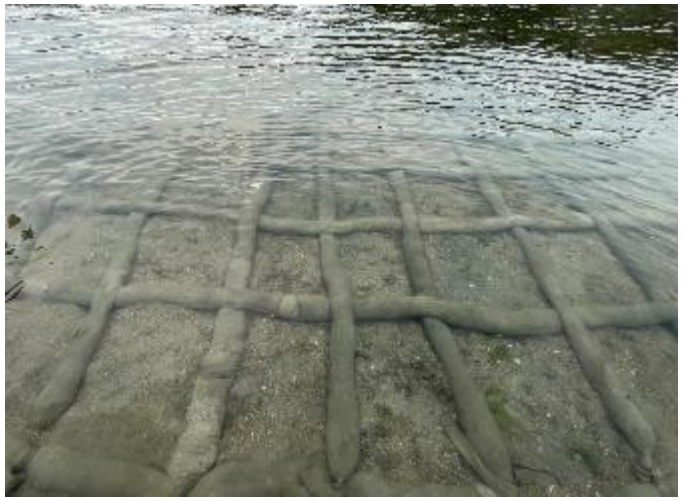
Trust in regional banks and utilization of networks

Activities in the verification experiment area at Innoshima Island, Onomichi City

July 28, 2022 Placement work

Mar. 2023
Site visit by those involved in the project

Eelgrass observed to have germinated



Placement completed

Monitoring using underwater drones

Mar. 2023
Seagrass beds in the experimental area

‘“Blue Carbon Valley" Concept’ to Cluster Blue Carbon Industries

‘“Blue Carbon Valley" Concept’ to Cluster Blue Carbon Industries

Blue technology cluster

DX・IOT

Information

TORAY Innovation by Chemistry

Material

いのちをつくるコンクリート 日建工学株式会社

Infrastructure

株式会社トロムソ TROMSO CO., LTD.

Venture

中外テクノス

Environmental Consultancy

Blue finance cluster

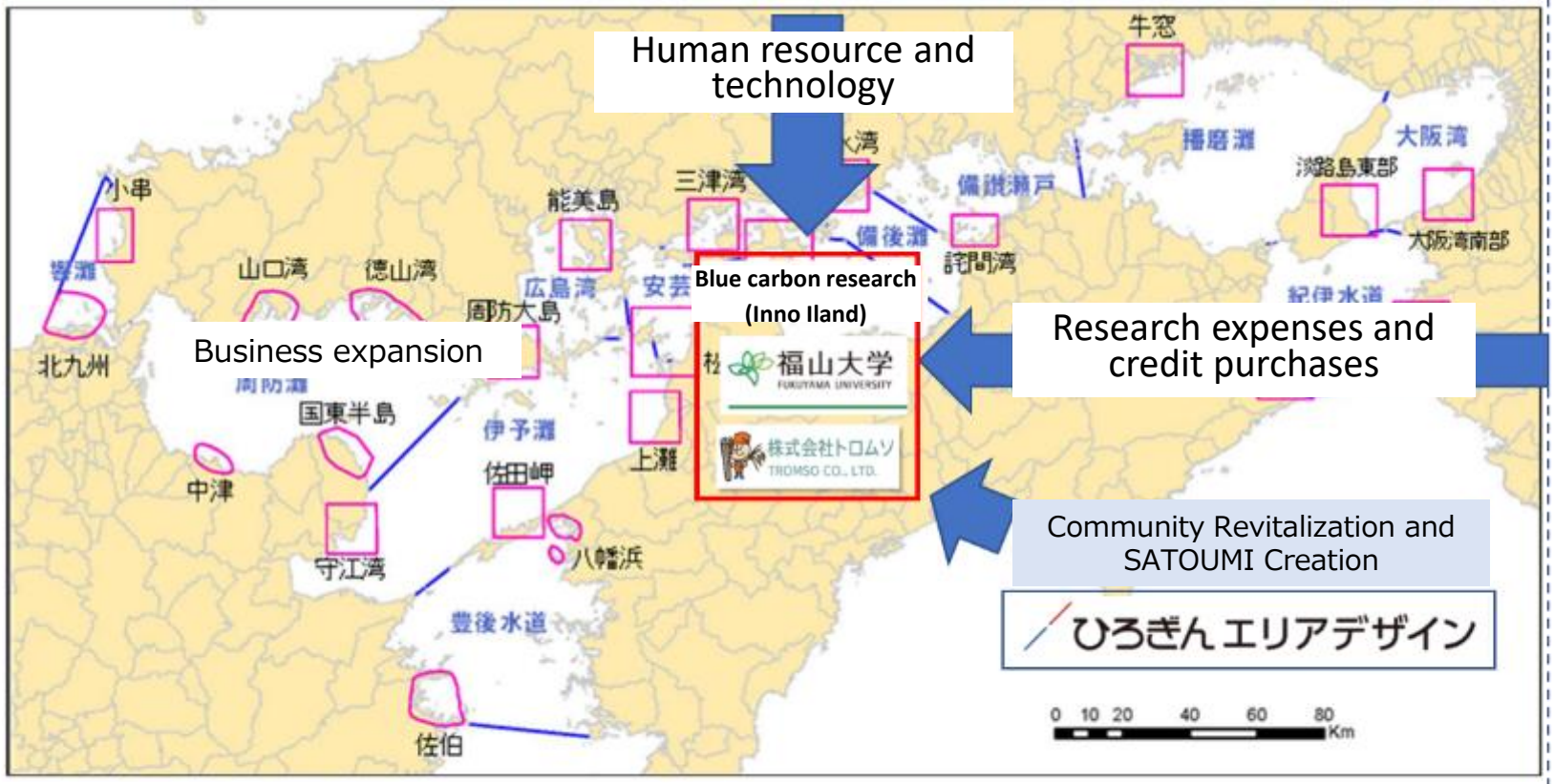
- Energy industry
- Financial industry
- Marine transport industry
- Regional development
- Trading companies

Human resource and technology

Business expansion

Research expenses and credit purchases

Community Revitalization and SATOUMI Creation



Survey data on the distribution of seaweed beds and tidal flats in the Seto Inland Sea (Ministry of Environment)

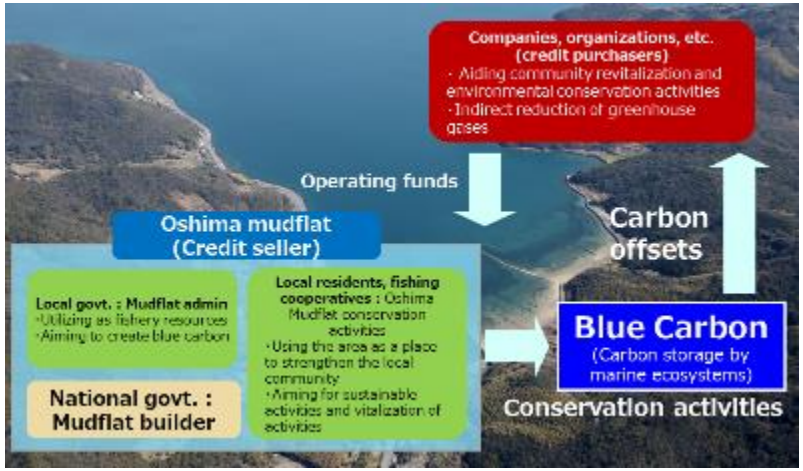
26 Shunan Oshima-Tidal-Flat “Tsunagaru”Blue Carbon Project in Tokuyama-Kudamatsu Port (Shunan City)

Chugoku & Shikoku

Vitalization of conservation activities and environmental education utilizing artificially created tidal flats, and promotion of fisheries and regional development through utilization of Oshima tidal flat.

Overview

- The Oshima Tidal Flat Cultivation Association was established in the artificial tidal flat created by utilizing dredged sediment in Tokuyama Kudamatsu Port, with the participation and cooperation of residents of the Oshima area and fishermen belonging to the Shunan General Branch of Yamaguchi Fishery Cooperative Assosication, who are engaged in activities to preserve the tidal flat as a valuable local resource.
- The Association for nurturing Oshima tidal flat, the fishery cooperative, and Shunan City work together to conserve and propagate clam resources, conserve eelgrass and eelgrass beds on the tidal flat, and support environmental education activities conducted annually in cooperation with the national government and Shunan City.



Basic Information

Region	Shunan City
Participating organizations	Association for nurturing Oshima tidal flat, Shunan General Branch of Yamaguchi Fishery Cooperative Assosication, Shunan City
Start year	2021
Contents of activities	• Sand covering and water depth adjustment • Environmental education and public awareness
Site area	17.8ha(No.1construction Area) 11.5ha(No.2construction Area)
Amount of CO2 absorption	76.7t-CO2 (J Blue Credit, FY2021:44.3t-CO2, FY2022:32.4t-CO2)

Project on Oshima Tideland

Conservation activities by the Association for nurturing Oshima tidal flat (launched in 2017)

- Conducted once or twice a month, maintaining the cover nets, culling clams, oyster aquaculture experiments, etc.

Removal of sand from nets

Culling Manila Clams

Clam breeding study group

Tests to cultivate clams

Oyster single-seed aquaculture experiment

Environmental education

- Every year, "Seaside Nature School" is held for elementary school students in the city and is used to learn about the marine environment by observing and learning about the abundance of the diverse flora and fauna that inhabit the tidal.

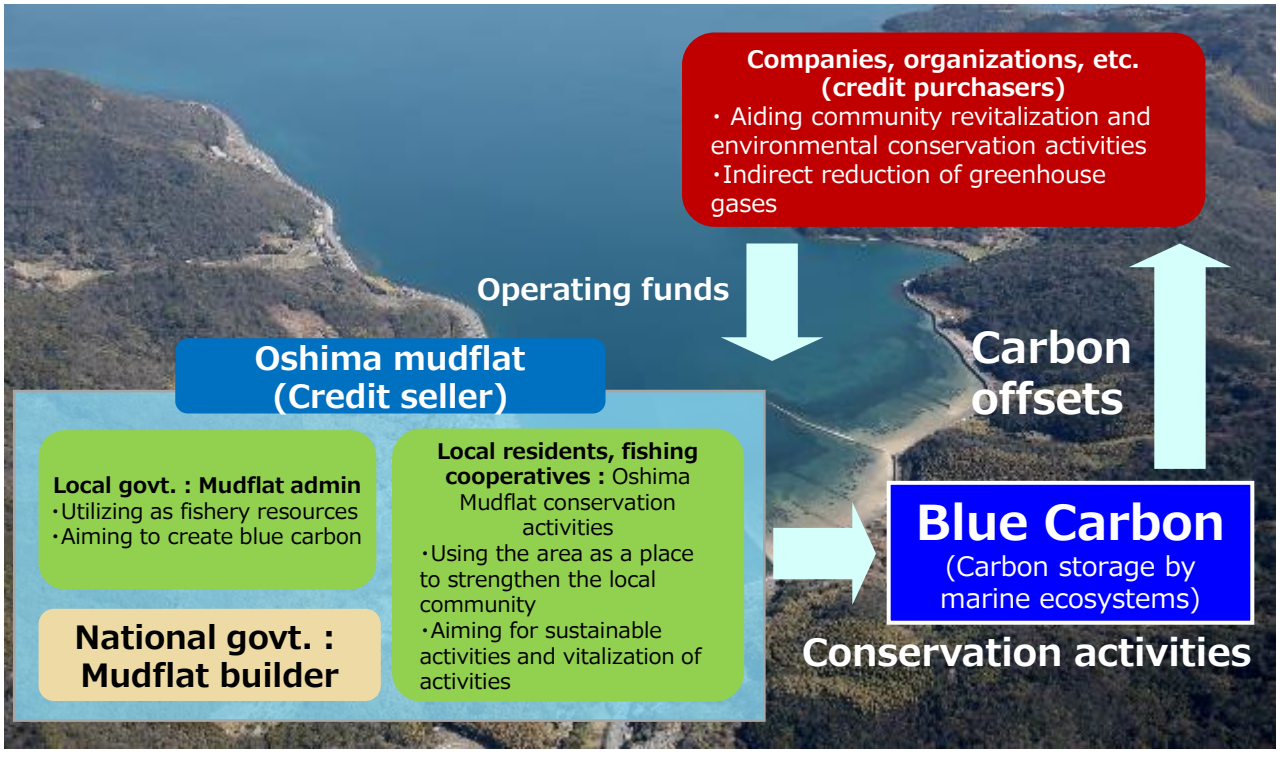
Utilization of the J Blue Credit System

Current Status and Issues of the Association for nurturing Oshima tidal flat

- Aging of members (60-70 years old) and slow growth in membership (currently 15 members)
- Almost no income from clam sales, which are the source of funds for the activities, makes it impossible to renew the nets and purchase young clams.

⇒ Ensuring vitalization and continuity of activities through J Blue Credit transactions

- Project Name: “Shunan Oshima-Tidal-Flat “Tsunagaru”Blue Carbon Project in Tokuyama-Kudamatsu Port”
- Applicant: Association for nurturing Oshima tidal flat, Shunan General Branch of Yamaguchi Fishery Cooperative Assosication, Shunan City



Disseminating Information of the Projects

Introducing activities and events in the “Oshima Tidal Flat Diary” on the Shunan City website in the style of a diary.

令和４年６月１３日（月）

アマモの観察会

アマモの観察会を実施しました。

アマモ場造成に関する専門家による観察会を実施し、アマモの種子採取方法等の指導を受けました。観察会では、モンゴウイカの卵やヨウジウオ、タツノオトシゴも観察され、アマモ場がもたらす生物の多様性を改めて体感することができました。

モンゴウイカ

イカの卵

令和４年９月２６日（月）

令和４年９月９日～11月22日 徳山下松港開港100周年記念事業「小学生社会見学」を大島干潟で開催

徳山下松港開港100周年を記念して、周南市、下松市、光市の各市内小学５年生を対象に大島干潟の見学会を開催中です。児童たちは、バスで現地を訪れ、大島干潟を育てる会の皆さんのご協力により、被覆網でのアサリの育成やカキの観察、干潟の生物の観察を行います。

＜写真左＞被覆網の一部を剥ぐって、アサリを掘って見せます。
＜写真右下＞アサリ種苗の砂袋を開けて、育っている貝を見せます。
＜写真左下＞潮打ち際まで移動して、水生生物や植物などを観察します。

令和５年１月２０日（金）　１３時３０分～１５時３０分

第１回大島干潟ブルーカーボン交流会

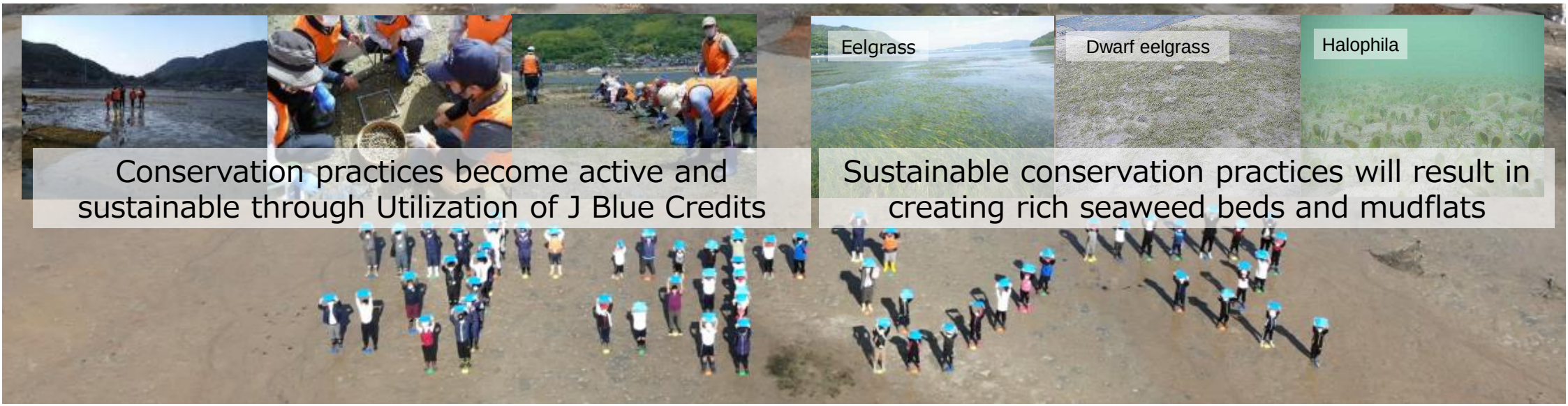
大島干潟が位置する鼓南地区の地元企業である日本精蝋さんと地元の鼓南中学校の生徒さんとの交流会を開催しました。大島干潟での保全活動に参加していただくと共に、大島干潟のブルーカーボン生態についても学んでいただきました。活動終了後には、干潟で採れたアサリやカキの試食会を行いました。

Future Development

In the future, we aim to achieve fisheries and regional development through the vitalization of conservation activities and environmental education and the utilization of the Oshima tidal flat by taking advantage of its characteristics (artificially created tidal flat).

- Contributing to CO2 reduction by propagating not only clams and oysters but also eelgrass and other sea plants and creating a marine environment that is habitable for marine organisms from the perspective of biodiversity, leading to the promotion of fisheries.

- Promoting local revitalization and regional development by inviting citizens and businesses to participate in hands-on conservation activities and environmental education.



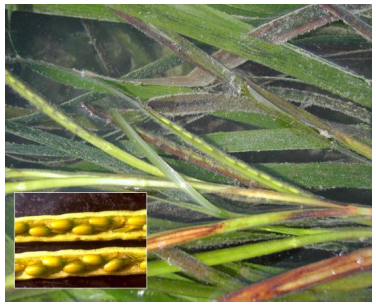
27 Blue Carbon Initiatives in the Fushino River Estuary and Tidal Flat (Fushino River Estuary and Tidal Flat Nature Restoration Committee)

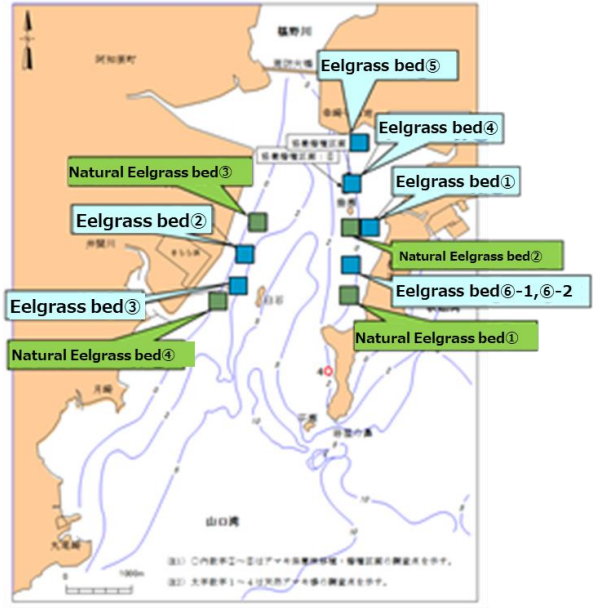
Chugoku & Shikoku

Councils with the participation of the national government, local governments, experts, NPOs, and local residents maintain and continue local sea restoration activities.
Eelgrass bed creation verification tests were conducted and discussions on blue carbon initiated.

Overview

- Tests for the creation of eelgrass beds started in 2003.
- In order to create seaweed beds, pretreatment of eelgrass seeding using the "sheet method," "colloidal silica method," "sandbag mat method," etc., are carried out to verify the effectiveness of these methods.
- A working group was established to study blue carbon in FY2022 and have been discussing the purpose and content of activities.





Basic Information

Region	Yamaguchi Prefecture
Participating organizations	Fushino River Estuary and Tidal Flat Nature Restoration Committee
Start year	2003
Contents of activities	• Seeding of seaweeds and transplanting of sporophyte • Improvement of water bottom quality (Sediment Resuspension) • Environmental education and public awareness
Site area	Approx. 150ha
Amount of CO2 absorption	—

Initiatives(FY2002～FY2005)

Eelgrass Bed Development Verification Test

- In January 2003, we conducted a verification test of eelgrass transplantation using the clay-bonding method at the Eelgrass Field (1) test site.
- Eelgrass seeding verification tests were conducted using the sheet method, colloidal silica method, and sandbag mat method.
- Verification tests were conducted with the participation of local residents.
- According to the survey conducted in 2005, there are 153 ha of eelgrass beds in Yamaguchi Bay, and the recovery trend of eelgrass beds were observed in almost all areas of Yamaguchi Bay except for the activity siteini

Flowering stem collection

Seeds collected

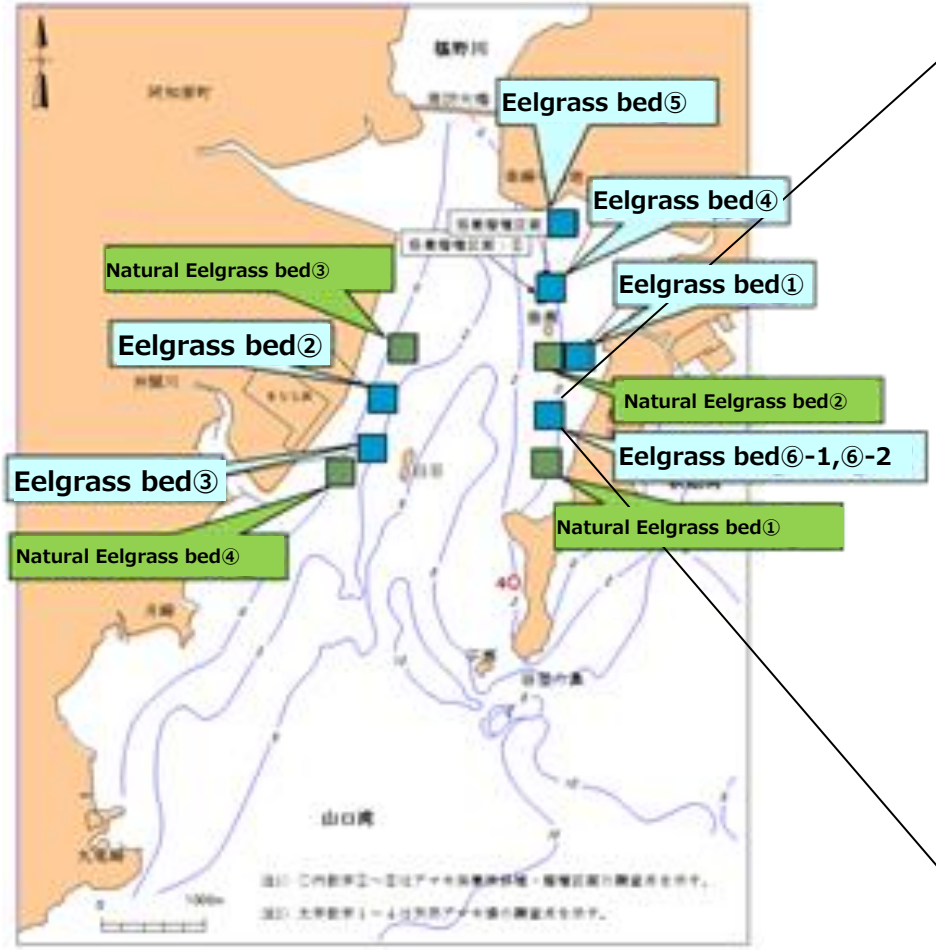
Preparation for sowing using Colloidal silica

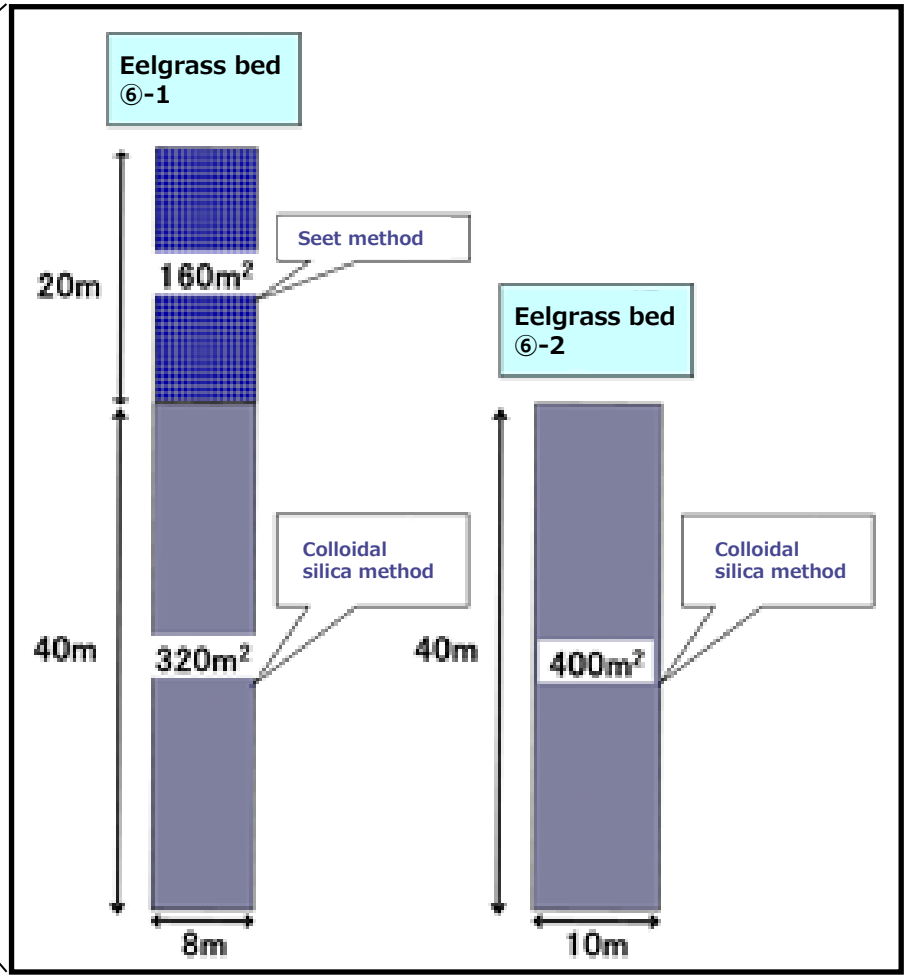
Preparation for seeding with gauze, etc.

Initiatives(FY2006～FY2008)

Yamaguchi Tidal Flat Productivity Restoration Project

- Eelgrass bed creation was conducted from 2006 to 2008 in the area where eelgrass was distributed as a test area.
- As a result of the survey in 2008, it was confirmed that 142 ha of eelgrass beds were distributed in Yamaguchi Bay, thus bringing an end to the eelgrass bed restoration activities.
- On August 1, 2010, an aerial photography survey was conducted of the eelgrass beds in Yamaguchi Bay. Compared to the results of the survey conducted in FY2008, expansion of eelgrass beds were confirmed in some areas of the Yamaguchi Bay.





Recent Initiatives（Establishment of Blue Carbon WG）

- In 2022, a working group was established to study Blue Carbon in the estuary of the Fushino River to increase the amount of carbon and biological production stored in tidal flats, while maintaining a good tidal flat environment.
- The working group discussed the purpose and content of activities and held study sessions.
- The working group plans to start by assessing the current status of eelgrass beds in places such as the Yamaguchi Bay.

28 Isomori Blue Carbon Project in Yamaguchi and Oita Prefecture(Uninomics K.K.)

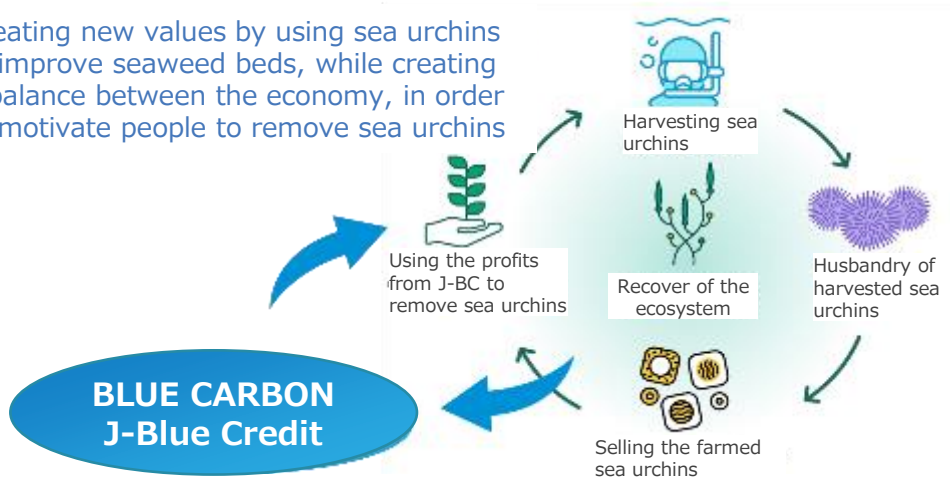
Chugoku & Shikoku

Sea urchin ranching to combat isoyake (urchin barrens) and create a circular economy, conserve seaweed beds, and contribute to local fisheries and restaurants.

Overview

- With the goal of protecting seaweed beds from overgrazing urchins, the company is engaged in continuous seaweed bed preservation activities while maintaining economic independence through the cultivation and sale of removed sea urchins.
- By protecting and restoring the seaweed beds, the project will increase the abundance of fish and abalone, which are feared to be in decline, and contribute to increased sales and profits for the local fishing industry and restaurants.
- Contributing to environmental improvement by returning a portion of profits from the sale of ranched sea urchins to sea urchin removal

Creating new values by using sea urchins to improve seaweed beds, while creating a balance between the economy, in order to motivate people to remove sea urchins



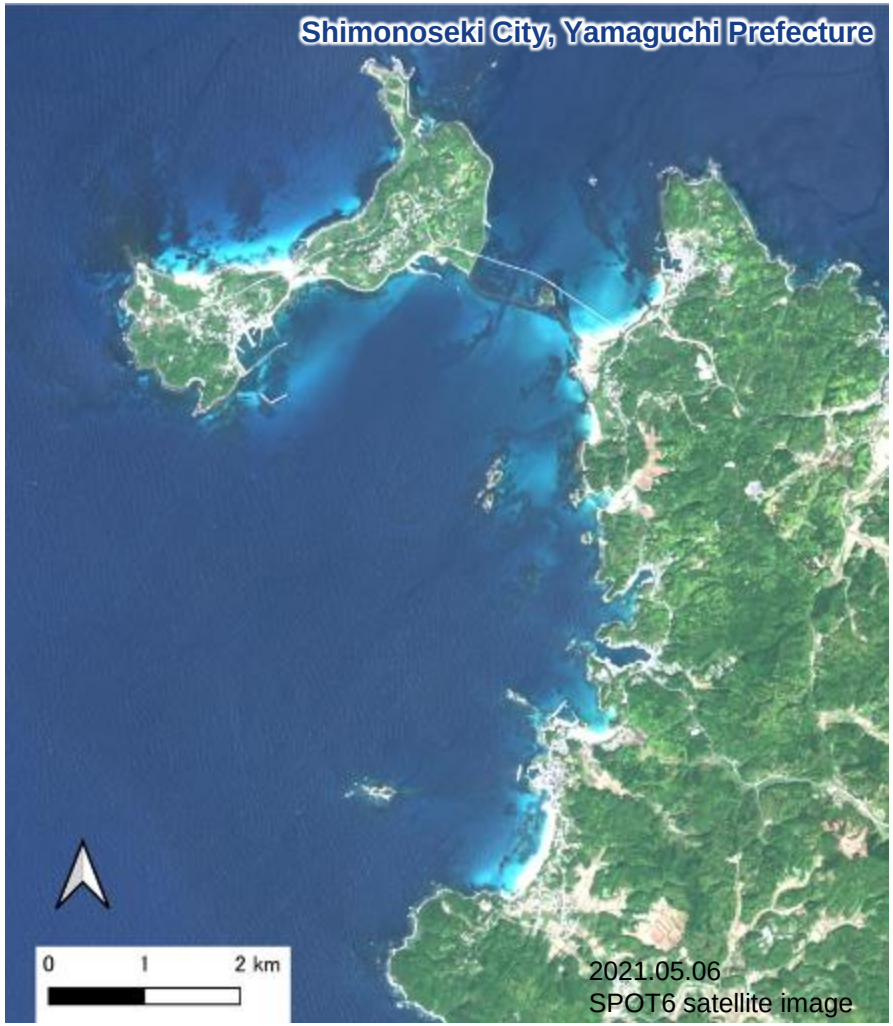
Basic Information

Region	Shimonoseki City(Yamaguchi Prefecture),Oita Prefecture
Participating organizations	Uninomics K.K., Maruyama Suisan Ltd., Yamaguchi Prefecture Fisheries Cooperative Association, K.K. Oita Uni Farm, Nagoya Yutakana Umituskurinokai Association, General Incorporated Non-Profit Association Mobile Sea Otters, ENEOS Holdings, Inc.
Start year	2021
Contents of activities	• Removal of pests(sea urchins)
Site area	3.8ha(Shimonoseki City) 8.9ha(Oita Prefecture)
Amount of CO2 absorption	Shimonoseki City,Yamaguchi Prefecture 2.0t-CO2 (J Blue Credit,2years from FY2021 to FY2022:2.0t-CO2) Oita Prefecture 0.6t-CO2 (J Blue Credit,2years from FY2021 to FY2022:0.6t-CO2)

Isomori Blue Carbon Project in Shimonoseki,Yamaguchi Prefecture

◆ Project Overview

- In the waters around Tsunoshima Island, ecklonia cava and sargasso, providing habitat for marine organisms, spawn substrate, and nursery grounds for juvenile fish.
- The seaweed beds have been damaged by sea urchins and are on the decline. To prevent further loss of seaweed beds, the sea urchins causing the damage have been removed since 2021, resulting in a recovery of the seaweed beds and an increase in CO2 absorption.
- The removal of sea urchins as part of a project to raise and sell them has created an incentive to remove them, leading to the improvement of seaweed beds and the expansion of CO2 absorption.
- Establishing the world's largest sea urchin farm nearby.



◆ Project Features and PR Points

- Fishermen's passion for the seashore and new challenges contribute to the creation of a rich ocean, the preservation of a beautiful ocean, and the achieve a decarbonized society.
- In monitoring, we cooperated with the Mobile Sea Otter Corps to **obtain more accurate and reliable data**.
- Removed sea urchins will be used as a new local specialty for regional development.

Accelerating Activities to Restore the Richness of the Seashore in Collaboration with Young Fishermen in Yamaguchi, Contributing to CO2 Absorption

Isomori Blue Carbon Project Nagoya Bay ,Oita Prefecture

◆ Project Overview

- Sea lettuce , Gelidium elegans, etc. thrive in Nagoya Bay and provide habitat for marine organisms.
- The seaweed beds are being damaged by sea urchins and are in decline, so we removed the sea urchins that were causing the damage. The seaweed beds are recovering after the removal of sea urchins, and the amount of CO2 absorption is increasing.
- Since August 2007, Nagoya Bay has been continuing to work with local elementary school students on measures to prevent isoyake in order to restore the rich seashore with seaweed beds. This project is part of their efforts to conserve and restore the seaweed beds by removing sea urchins since September 2021.
- The project is accelerating the regeneration of the seaweed beds by working as a business to raise and sell the removed sea urchins.
- This year, we have worked on obtaining credit certification only for the removal of sea urchins.

◆ Project Features and PR Points

- Since 2007, the Nagoya Bay has been actively working on countermeasures against isoyake and restoration of seaweed beds.
- In monitoring, the company has worked with the Mobile Sea Otter Corps to **obtain more accurate and reliable data**.
- Removed sea urchins are being used as a new local specialty for regional development.

Restoring Oita's rich seashore, expanding CO2 absorption and contributing to regional development

Removed sea urchins are ranched on land and commercialized as local specialty sea urchins

Commercialization in 8-12 weeks

- We collaborate with research institutions, equipment manufacturers, feed manufacturers, and developed specialized feed and equipment for sea urchin ranching.
- The optimal environment for sea urchins is created, allowing for year-round production and shipping, regardless of the season.
- Recirculating aquaculture systems (RAS) is adopted on land to avoid polluting the sea and preventing further proliferation of sea urchins through egg release.

Estimation of Blue Carbon in Natural Seaweed Beds after Sea Urchins Removed

Blue carbon is carbon dioxide in the biomass of seaweed that has been increased by humans.

Mapping of seaweed beds by satellite image analysis and field survey

- Mapping the distribution of seaweed beds of the preceding year of the project (project area and adjacent areas)
- Mapping the distribution of seaweed beds in both areas in the year when sea urchins were removed
- Calculate the annual rate of change of each seaweed bed area

Change in distribution of seaweed beds

- Annual rate of change of seaweed bed distribution area
  = seaweed bed area in the current year / seaweed bed area in the previous year
- Annual rate of change in area of seaweed beds in sea urchin removal area > Annual rate of change in area of seaweed beds in sea urchin removal area

Increased area of seaweed beds by manpower (blue carbon seaweed bed area)

Blue carbon seaweed bed area
= seaweed bed area of sea urchin removal area in the current year -
Sea urchin removal area in the previous year * sea urchin removal area annual rate of change

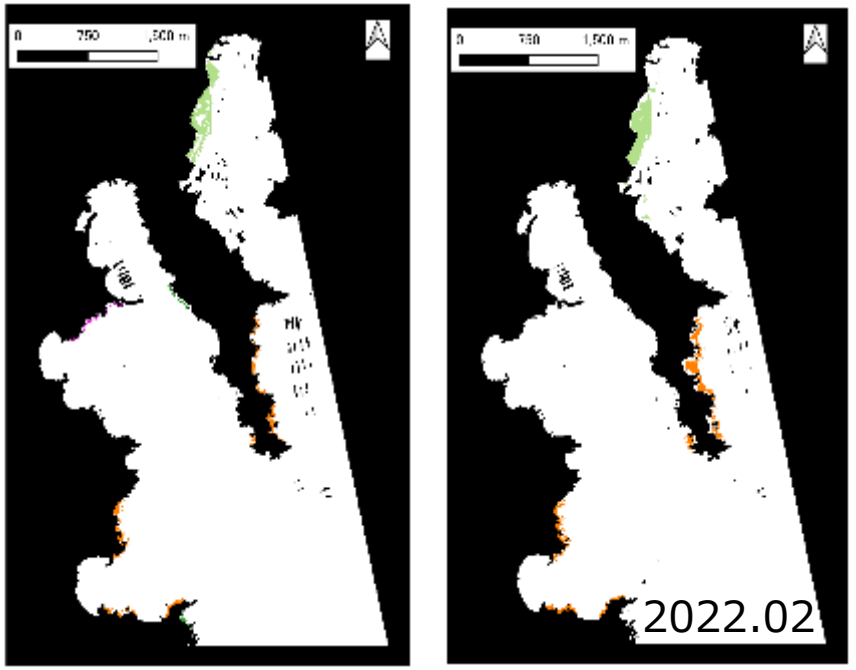
Blue Carbon wet weight and Blue Carbon

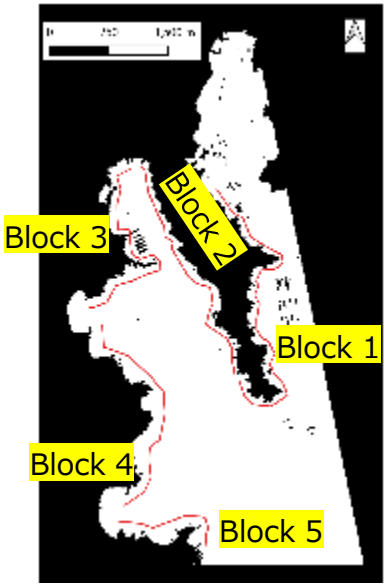
- Measurement of seaweed biomass per unit area by trimming
- Wet weight of **blue carbon** = present amount of seaweed per unit area * area of **blue carbon** seaweed field
- Wet weight of seaweed was converted to dry weight according to the literature, and the amount of CO2 fixation was estimated from its C content per unit dry weight.

Increase in the growth rate of Gelidium elegans distribution area due to sea urchin removal activities

The increase in area of Gelidium elegans distribution in Block 1, where sea urchin removal activities were conducted in 2021, was greater than in Block 4 and Block 5, where no removal activities were conducted.

Increase in Gelidium elegans area resulting from sea urchin removal activities
= Blue Carbon





Location and amount of sea urchin removal

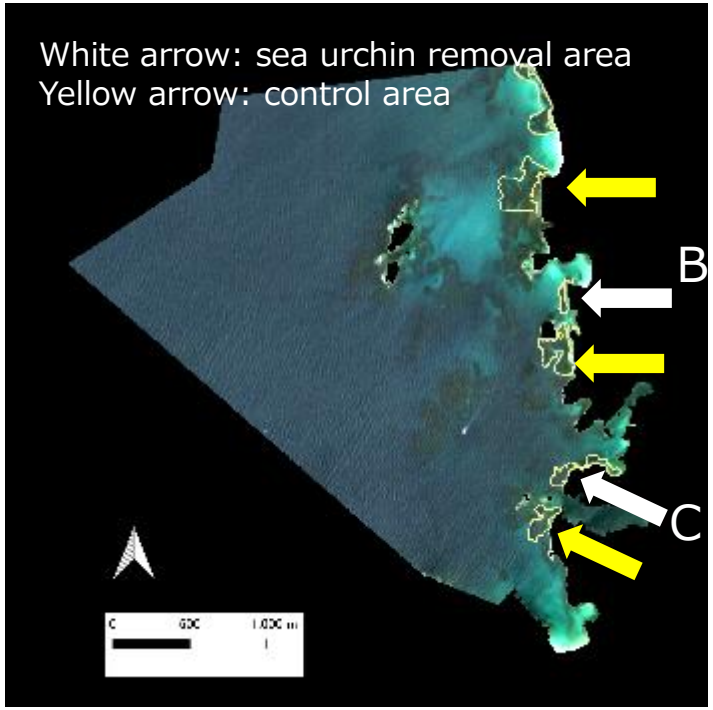
Year	Month /day	Weight (kg)	Block number
2021	20 June	74.0	2
2021	24 September	184.4	1
合計		258.4	

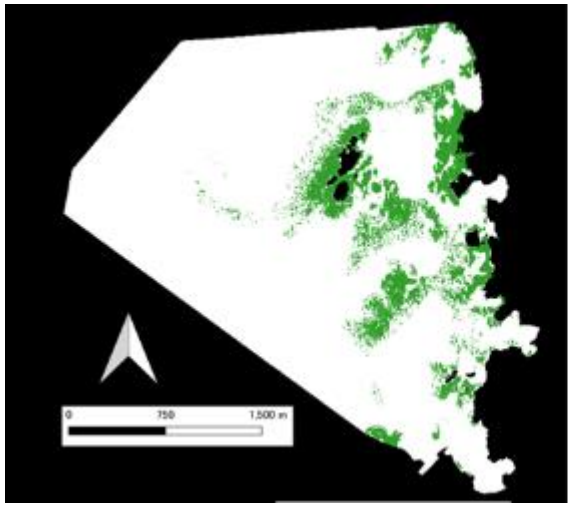
Area of seaweed beds in sea urchin removal area	Types of Algae	28 February 2021 (m2)	19 February 2022 (m2)	Percentage increase or decrease	Percentage increase or decrease (Gelidium amansii)
Block1	Gelidium elegans	28591.0	42688.8	1.49	1.49
Block2	Argassum siliquastrum	5070.9	0.0	0	
Block3	Ecklonia cava	10537.6	0.0	0	
Block4	Gelidium elegans	21254.9	26613.6	1.25	1.25
Block5	Gelidium elegans	16148.0	19636.5	1.22	

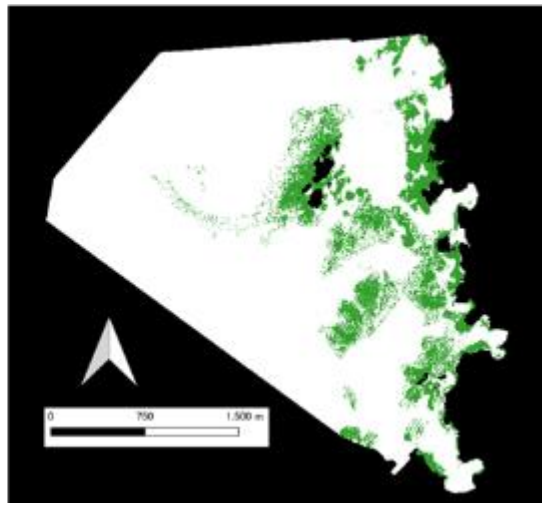
Increase in the growth rate of seaweed bed distribution area due to sea urchin removal activities

- The percentage increase in area of seaweed bed distribution in Block 1, where sea urchin removal activities were conducted in 2021, was greater than in the target area where no removal activities were conducted.

Increase in the area of seaweed beds resulting from sea urchin removal activities＝Blue Carbon







Comparison of seaweed bed area between 2021 and 2022

	Area of seaweed bed distribution(m2)		Percentage increase or decrease	Area of seaweed bed distribution(m2)	
	May,2021	May,2022		Target area (no removal activities were conducted)	Block 1 (sea urchin removal activities were conducted)
Area A	17677	18577	1.050914	15697	2880
Control area	48531	43094	0.887969		
Area B	1944	5256	2.703704	1857	3399
Control area	27433	26209	0.955382		
Area C	7668	14221	1.854591	7316	6905
Control area	13321	12709	0.954058		

The increase in the growth rate of eelgrass bed distribution in the areas where sea urchins were removed in 2021 was greater than that in the areas where no removal activities were conducted.
The sea urchin removal activities have been successful.

29 Tottori Prefecture Seaweed Bed Cultivation Action Program (Tottori Prefecture)

Chugoku & Shikoku

**The program was created to establish a concrete action plan for the recovery of seaweed beds.
Through collaboration with local authorities and fishing organizations, the program aims to maintain and create a rich fishing environment by enhancing environmental functions such as carbon dioxide absorption and water purification.**

Overview

- Focusing on the carbon dioxide absorption capabilities, we implemented the production and transplantation of seedlings of arame, a large perennial seaweed.
- Following the successful formation of underwater forest through arame cultivation trials, the Tottori Prefecture Seaweed Bed Cultivation Action Program was established in FY2004, expanding the arame seedling installations to 14 locations within the prefecture.
- In some areas, damage(caused by sea urchins) and arame mortality due to high water temperatures were observed. In response, Program II was launched in FY2016, promoting measures against sea urchins and strategies to mitigate the effects of high-water temperatures.
- Starting from FY2015, there was a significant increase in the population of Japanese purple sea urchins. In FY2022, Program III was launched to strengthen and establish a system for sea urchin removal.

Base installation for seedlings

Installation of seedlings

Basic Information

Region	Tottori Prefecture
Participating organizations	Tottori Prefecture, Tottori Prefecture Coastal Fisheries Cooperative Association, Tottori Prefectural Fish Farming Association(Public Interest Incorporated Foundation)
Start year	1984
Contents of activities	• Installation of seedlings (arame, etc.) • Installation of sporophyte (kurome, etc.) • Feeding damage control (extermination of sea urchins)
Site area	–
Amount of CO2 absorption	–

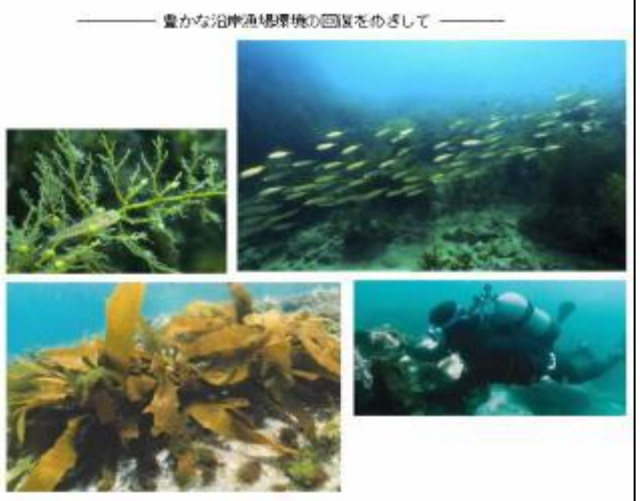
Tottori Prefecture Seaweed Bed Cultivation Action Program I-III initiatives

Background & Purpose

In Tottori Prefecture, due to the successful establishment of arame seedling production and plantation techniques, an action plan for the creation of sea oak seaweed beds was formulated in FY2004, known as the Tottori Prefecture Seaweed Bed Cultivation Action Program. Subsequently, in FY2015, Program II was established, and further in FY2022, Program III was formulated.

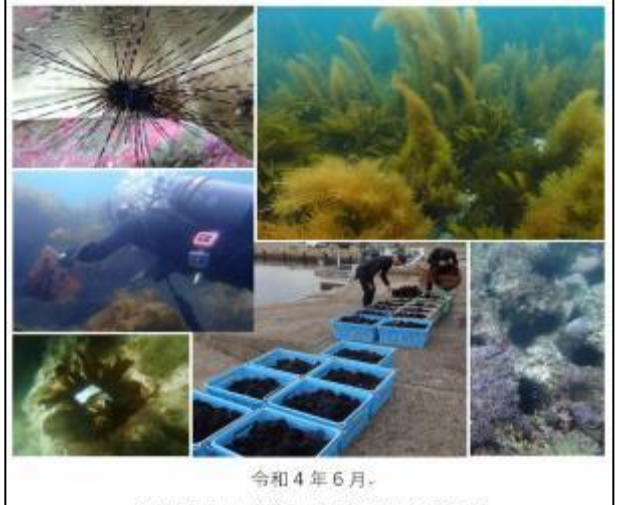
Promoting the recovery of seaweed beds along the coast of Tottori Prefecture to maintain and create a rich fishing environment

Tottori Prefecture Seaweed Bed Cultivation Action Program



Tottori Prefecture Seaweed Bed Cultivation Action Program II

Tottori Prefecture Seaweed Bed Cultivation Action Program III



Details

・Installation of arame seedlings using straw-rope and plate methods
・Installation of arame seedlings utilizing fishing ports

＋

・Reduction of damage caused by sea urchins and herbivorous fish, and measures against high water temperatures by installing arame seedlings in mixed seaweed beds and locations with good water circulation.

＋

・To address the significant increase in Japanese purple sea urchin populations, the establishment and strengthening of a sea urchin removal system, with concentrated removal of sea urchins throughout the prefecture.

30 Tottori Blue Carbon Project

(The Tottori Blue Carbon Project “Aiming for Restoration of the Rich Sea” Executive Committee)

Chugoku & Shikoku

The Tottori Prefectural Fisheries Cooperative Association, Tottori Prefectural Fish Farming Association , Tottori Prefecture, The Norinchukin Bank, and others will work together, both with the public and private sectors, from exterminating purple sea urchins to preventing the loss of seaweed beds, to their aquaculture, processing, local consumption, and promotion of awareness on marine issues consistently.

Overview

- Massive outbreaks of Japanese purple sea urchins are causing serious loss of seaweed beds along the coast of Tottori Prefecture.
- Sea urchins living in areas where seagrass beds have decreased are not very abundant, so efforts are being made to develop farming techniques that will improve the profitability of sea urchins.
- With the cooperation of local restaurants, creating sea urchin menus to serve sea urchins on a trial basis.
- Widely sharing seaweed bed restoration activities through events focusing on sea urchins, lectures at elementary and high schools, and publicity to increase awareness of the issue of ‘isoyake' in the sea.

Basic Information

Region	Tottori Prefecture
Participating organizations	The Tottori Blue Carbon Project “Aiming for Restoration of the Rich Sea” Executive Committee, Tottori Prefectural Fish Farming Association(Public Interest Incorporated Foundation)
Start year	2022
Contents of activities	• Developing farming techniques for purple sea urchins • Environmental education and public awareness • Creating sea urchin menus ※Tottori Blue Carbon Project is funded by The Nippon Foundation “Umi-to-Nippon Project” (The Ocean and Japan Project)
Site area	–
Amount of CO2 absorption	–

Initiatives for "Regional Model of Umi no Gochisou in Tottori" in FY2022

Background & Challenges

▼Creating Japan's first model of blue carbon action, promoted by both the public and private sectors, and restoring the richness of Tottori's oceans by communicating ocean issues through food

・The loss of seaweed beds is progressing due to feeding damage caused by the spread of purple sea urchins as a result of global warming, etc., and biodiversity and greenhouse gas absorbers are in decline.
・Large numbers of purple sea urchins are not eaten very often due to their low body content and are not commonly sold in the region.
・Compared to the marine plastics issue, which has received the most attention in the marine issues, the issue of isoyake is less well known to society.

Efforts and Results

①

A kick-off event was held with approx. 600 participants.

②

The project was introduced in a class for high school and elementary schools

③

Farming of exterminated sea urchins Technology under development, including cryopreservation

Quantitative results (project expansion)

① The kick-off event was attended by approx. 600 people, mainly elementary school students and families. The prefectural governor also took the stage, and the event was reported by three TV networks and newspapers.

② One hands-on event (delivery class) was held for elementary school students and five for high school students. They were reported on TV and in newspapers.

③ The menu will be served this winter in collaboration with 20 restaurants and one school for school lunches.

Qualitative results (seeds for the next stage)

① At the kick-off event, many people said they were unaware of the issue of isoyake occurring in the local ocean. The event provided an opportunity for visitors to learn about the issues in the ocean.

② In May, the prefectural governor announced the start of the project at a press conference, and the project was reported in several media sources shortly after its launch.

③ Started cooperation with local agricultural cooperatives and others interested in this project in providing vegetable and fruit residues for use in sea urchin farming.

2022 Issues

① Sea urchin aquaculture technology using vegetable and fruit residues in Tottori Prefecture is underway
②Development of a menu that is easy to serve and versatile, with limited quantities of sea urchin
③ Utilization of social media/website to communicate and create buzz around the project

2023 Points of improvement

① Improve sea urchin aquaculture techniques through study sessions with aquaculture companies
②Development and improvement of more spreadable menus with the prospect of a stable supply of sea urchins
③ Effective communications in collaboration with companies that possess the know-how

Initiatives for "Regional Model of Umi no Gochisou in Tottori" in FY2022

Governor's Press Conference【May】
The prefectural governor announced the start of the PJ at a press conference, and the project was reported in several media sources shortly after its launch.

Aquaculture sea urchins【May～】
Tried quick freezing.
The natural flavor of the ingredients comes out due to the non-use of alum.

Menu development review meeting【May, June, October】
At the June review meeting, a variety of Japanese and Western ideas were discussed.
Four TV stations visited for coverage

Events for elementary and high school students【May - February】
Provided them with the opportunity to learn about the issues facing Tottori oceans

Run a store in Gochiso Fes【October 8, 9 in Tokyo】
Opened a booth with sea urchin rice ball croquettes with a local chef from Tottori

Collaboration with restaurants
【27,February～5 March】
Recipe development of restaurants（unohana Sea Urchin）
Tottori Unohana Sea Urchin Festival was held

Initiatives for "Regional Model of Umi no Gochisou in Tottori" in FY2023

Aims

▼Creating Japan's first model of blue carbon action, promoted by both the public and private sector, and restoring the richness of Tottori's oceans by communicating ocean issues through food

- The Tottori Prefectural Fisheries Cooperative Association, Tottori Prefectural Fish Farming Association, Tottori Prefecture, The Norinchukin Bank, and others will work together, both with the public and private sectors, from exterminating purple sea urchins to preventing the loss of seaweed beds, to their aquaculture, processing, local consumption, and promotion of awareness on marine issues consistently.
- Rather than simply exterminating purple sea urchins, the project will improve the quality of sea urchin by farming, develop processed products and menus with locals, and package them with a strong message. The popularity of the project is expected to further raise awareness of the issues of isoyake and blue carbon throughout Japan.

Summary

Social issues behind the project and their solutions

Issues

①The loss of seaweed beds (=isoyake) is progressing due to feeding damage caused by the spread of purple sea urchins as a result of global warming, etc., and biodiversity and greenhouse gas absorbers are in decline.
②Large numbers of purple sea urchins are not eaten very often due to their low body content and are not commonly sold in the region.
③Compared to the marine plastics pollution, which has received the most attention in marine issues, the issue of isoyake is less well known to society.

Solutions

①Establish a system for purple sea urchin aquaculture by utilizing crop residues collected in the prefecture and other resources in cooperation with the extermination project conducted on an unprecedented scale in Japan
②Develop processed products, menus, and merchandise using purple sea urchin, as well as develop and popularize them in the region to increase the exposure of and generalize purple sea urchin in the region as well
③ Expand awareness of isoyake as an issue in the ocean through increased consumption in school lunches, restaurants, retail stores, etc., and through communication of ① and ②

2023 Targets

●Establish a model that can be deployed nationwide for blue carbon actions promoted by both the public and private sector, with sea urchin extermination as the gateway.

①Strengthen cooperation among school food service, restaurants, retailers, etc.
②Develop and expand processed purple sea urchin products, menus, and merchandise in collaboration with local people, taking into consideration the season and other factors. Make it a hot topic in the region.
③Expand local awareness of the isoyake issue via the development process and other scheduled events within the prefecture.
→ In the medium-term, provide opportunities to think more about the sea through the provision to school lunches of prefectural marine fish species whose abundance is expected to recover due to sea urchin extermination, etc.

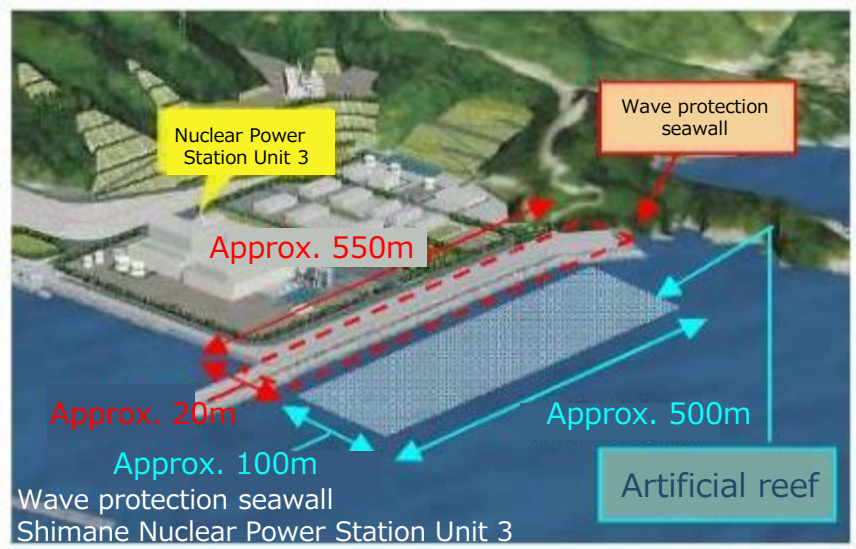
31 Creation of seaweed beds by artificial reefs and seawalls at Shimane Nuclear Power Station Unit 3(The Chugoku Electric Power Co., Inc.)

Chugoku & Shikoku

Artificial reefs made of blocks to which seaweed easily adheres are installed to promote seaweed bed formation.

Overview

- At Shimane Unit 3, a seawall was installed in combination with an artificial reef (shallow water) to reduce the impact of winter waves and other factors.
- The seawall is made of blocks to which seaweed easily adheres, out of consideration for the environment. Seaweed bed formation confirmed.
- 15.7 tons of CO2 absorption over 5 years from 2017 to 2021 was certified and obtained as J Blue Credits
- J Blue Credits are currently being discussed with Matsue City to decide how to utilize them to contribute to the formation of a sustainable local community.



Basic Information

Region	Matsue City (Wave protection seawall ,Shimane Nuclear Power Station Unit 3)
Participating organizations	The Chugoku Electric Power Co., Inc.
Start year	2007
Contents of activities	Installation of blocks or other substrate
Site area	7.6ha（Artificial reef ） Approx. 6ha（Seaweeds Beds on the Artificial Reef）
Amount of CO2 absorption	15.7t-CO2 (J Blue Credit,5years from FY2017 to FY2021:15.7t-CO2)

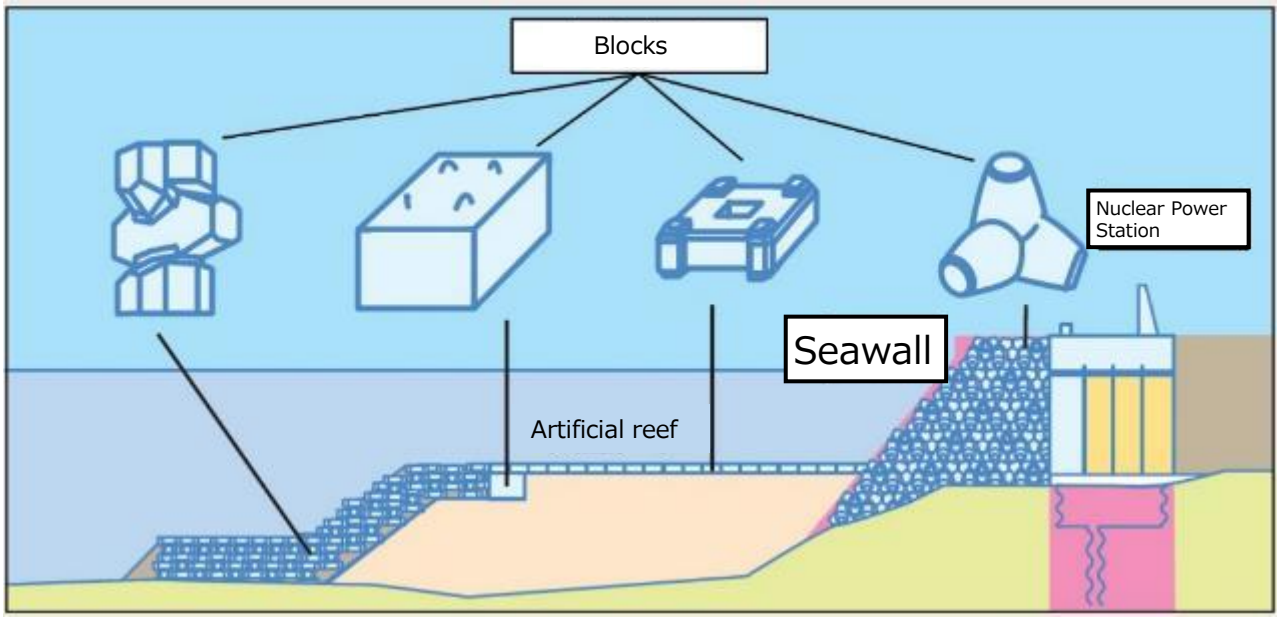
Efforts at the Shimane Nuclear Power Station

- **Adoption of wave protection seawall with artificial reef**

  The seawall for the Shimane Nuclear Power Station Unit 3 adopts seawall protection with an artificial reef. Due to a shallower water depth, it is expected that sunlight will reach the seabed more easily, providing a favorable environment for the growth and reproduction of marine algae. Since 2007, continuous post-research have been conducted to monitor the growth of seaweed on the artificial reef.

- **Checking the seaweed beds**

  Although some of the existing marine algae were lost due to the installation of the artificial reef, a new seaweed bed was formed on the artificial reef, providing a good growth site for seaweed (*Ecklonia kurome*, *Sargassum macrocarpum*, etc.) and contributing to climate change mitigation by absorbing CO2 through the seaweed bed that was formed.



Cross section of artificial reef

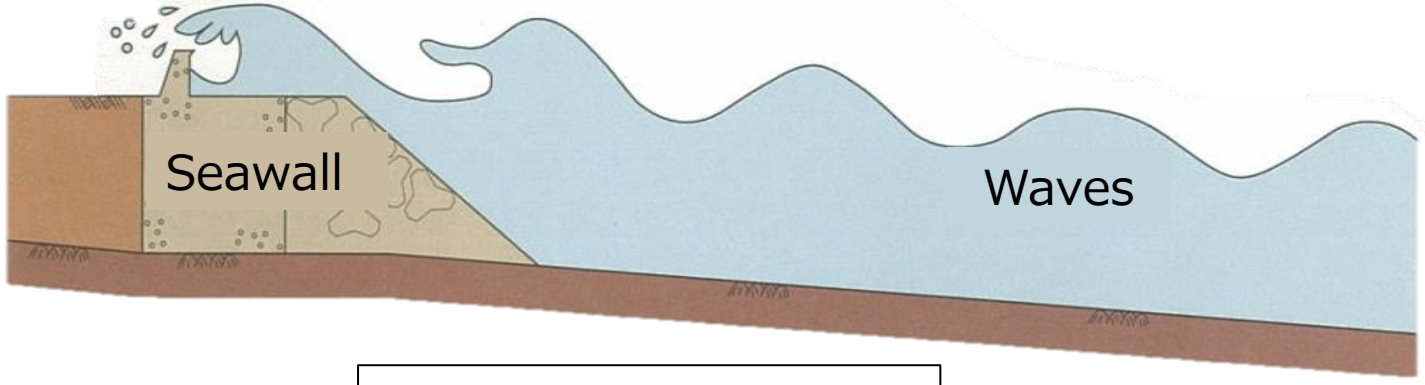
Seaweeds Beds on the Artificial Reef

Purpose of Artificial Reef Installation (effectiveness)

- Forces large waves to break and reduces the size of waves reaching the seawall.
- Eliminates the need for waterproof work during construction, reducing the construction time and costs.
- Allows sunlight to easily reach the seawall, thus making it possible for marine algae to grow and reproduce while providing a good habitat and breeding ground for benthic organisms that feed on these plants and grasses.

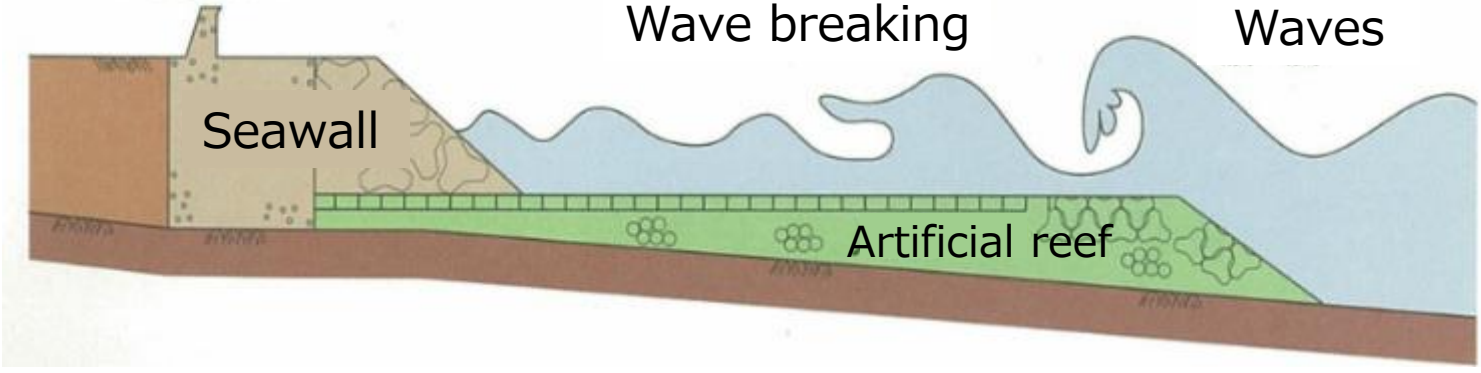
Overtopping wave size
Large

In the absence of an artificial reef



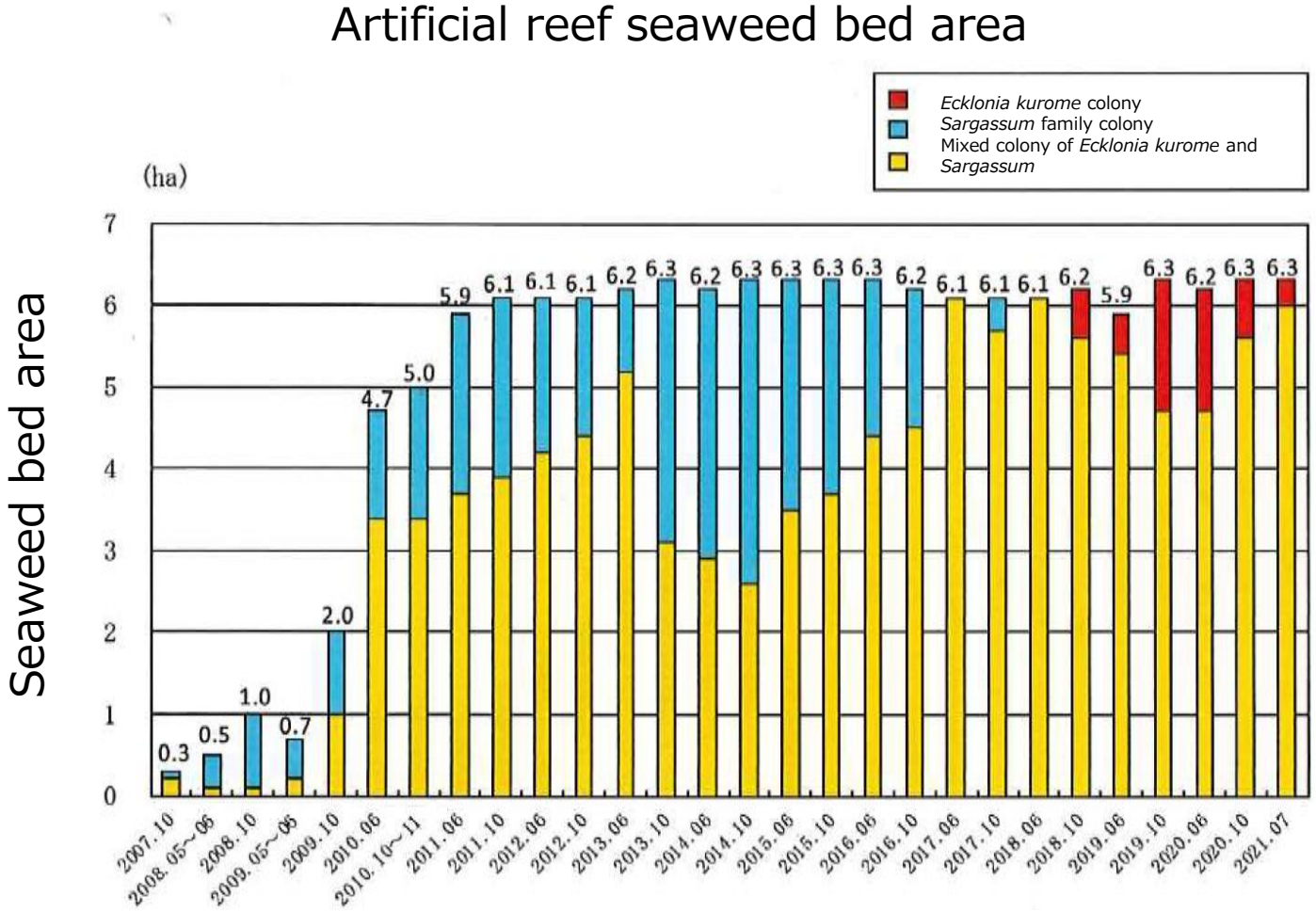
Overtopping wave size
Small

With artificial reef



State of Seaweeds Beds on the Artificial Reef

- Seaweed beds within the artificial reef are developing gradually, with approx. 6 *ha* of algae beds currently confirmed.
- Vegetation within the artificial reef has reached a near-extreme state, equivalent to about 80% of the total area of the artificial reef (7.6 *ha*).



Around 6m depth

Around 8m depth

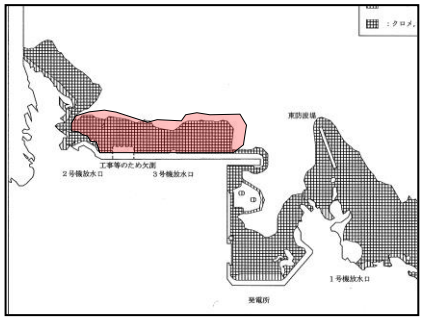
Around 8m depth

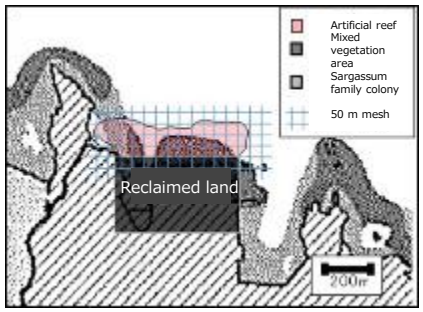
Note: Part of the artificial reef was not researched in May - June 2008, May - June 2009, June 2017, October 2017, June 2018 and June 2019 due to construction and other reasons.

J Blue Credit Certification Amount

Subject period: 5 years from FY2017 to FY2021

Certified amount: Seaweed bed CO2 absorption amount – Baseline – Vessels CO2 = Certified amount





FY	Seaweed beds CO2 absorption ( ) is before multiplying by ※1.	Baseline and vessels CO2	Certificated amount
2017	12.0 (16.7)	9.4	2.6
2018	13.1 (18.2)	9.4	3.7
2019	14.9 (20.7)	9.4	5.5
2020	13.9 (19.3)	9.4	4.5
2021	8.8 (12.2)	9.4	-0.6※2
Total of the 5yrs above	**—**	**—**	**15.7**

*1 Assessment of certainty of area: 90%, Assessment of certainty of absorption coefficient: 80%
*2 Decrease due to the decrease in dense vegetation area in the entire seaweed bed due to typhoons, etc. (currently showing a recovery trend) and changes in the composition (types) of vegetation

32 Ainan Town's Marine Industry Initiatives (Ainan Town)

Chugoku & Shikoku

Improving fishing environment by restoring seaweed beds by effectively using unused resources of the town's specialties and conducting educational activities for students to learn about the fishing industry and provide practical training.

Overview

- Improvement of the fishing environment through introduction of seaweed seeds and seedlings, installation of seaweed bed reefs, extermination of sea urchins, which are harmful species, and monitoring surveys to restore seaweed beds and purify the water quality
- Selling the removed sea urchins that are cultivated after removal and fed discards of town grown broccoli and kawachi-bankan citrus, effectively utilizing the town’s resources.
- Providing schools in the town with "fishery education" and field training to learn about the local fishery industry in general and developing human resources with a high awareness of environmental issues.

Basic Information

Region	Ainan Town
Participating organizations	Ainan Town, Ehime University, Fishermen,Fishery cooperative, Diving shops, Educational institution
Start year	2018
Contents of activities	• Seeding of seaweeds and transplanting of mother algae • Installation of blocks and other substrates • Removal of pests (sea urchins) • Environmental education and public awareness
Site area	3ha
Amount of CO2 absorption	–

Efforts to Improve the Fishing Environment

- Sea urchins continue to increase in the coastal areas of Ainan Town, while seaweed is decreasing, resulting in severe isoyake.
- The decrease in seaweed is thought to be related to the decrease in number of fish catch and the risk of harmful plankton blooms that cause red tide and shellfish poisoning, etc. By implementing initiatives to restore seaweed beds, we aim to improve the fishing environment and create a decarbonized society.

● Actions related to blue carbon
・Introduction of seaweed seedlings/mother seaweeds
・Placement of seaweed bed reefs
・Extermination of pests (sea urchins)
・Monitoring, etc.

●Bodies involved
・Fishermen
・Fishery cooperative
・Diving shops
・Ainan town
・Ehime Univ.

Photo of isoyake area

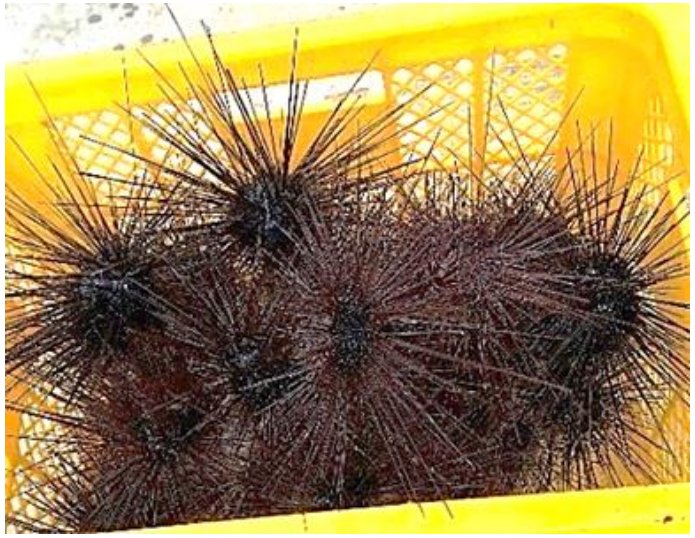
Photo of *Sargassum* bed

Efforts to Revitalize Local Communities (Effective Utilization of Unused Resources)

- Although Ainan Town has a thriving fishing and aquaculture industry, the town is facing issues such as declining catches and reduced income due to red tide outbreaks and mass mortality of fishery resources caused by pathogens.
- To effectively use existing facilities and unused resources, and to achieve not only a short-term source of income but also a sustainable fishing industry, the town is taking on the challenge of commercializing new marine products that have less impact on the fishing environment during the production process.

● Actions related to blue carbon
- **Making long-spined urchin edible**
  The exterminated long-spined urchin is fed with disposed parts of broccoli and kawachi-bankan, a specialty of the town
- **Aquaculture of hirome**

● Bodies involved
- **Fishermen**
- **Fishery cooperative**
- **Diving shops**
- **Ainan town**
- **Ehime Univ.**



Long-spined sea urchin

Product development (Long-spined sea urchin)

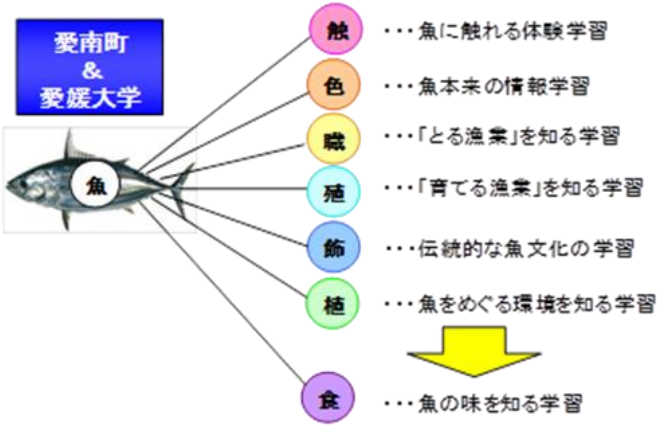
Aquaculture of hirome

Efforts to Revitalize Local Communities（Educational Activities)

- The fishing industry is a key industry in Ainan Town, but the number of fishermen are decreasing and there are a shortage of successors.
- In cooperation with fishery cooperatives and educational institutions, the town implements human resource development projects that include "fish education" to learn about the local fishing industry in general and awareness-raising on blue carbon, to foster new fishery workers and develop human resources who can act voluntarily on environmental issues.

● Actions related to blue carbon
・Fish education
At each day-care center, elementary and junior high school in the town
・Human Resource Development for Fisheries
Focusing on high schools in the town
・Field study

●Bodies involved
・Ainan town
・Fishery Cooperative
・Fishermen
・Ehime Univ.
・Educational institutions



Fish education

Development of web applications

Field study(Ehime Univ.)

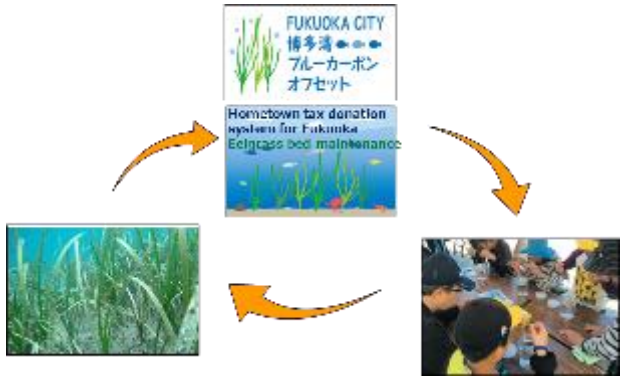
33 Blue Carbon Initiatives (Fukuoka City)

Kyushu & Okinawa

‘Fukuoka City Hakata Bay Blue Carbon Offset System’ in operation.
Collecting donations through the hometown tax donation program for environmental conservation activities in Hakata Bay.

Overview

- A new network called the Hakata Bay NEXT Conference, which connects organizations that have been creating eelgrass beds in various areas of Hakata Bay, was established. Citizens, civic organizations, fishery organizations, businesses, schools, and government agencies collaborate to implement and publicize activities in Hakata Bay.
- The amount of CO2 absorbed by eelgrass and other seaweed beds in Hakata Bay are is converted into credits and sold. Profits from the sale are used for environmental conservation and creation activities, such as eelgrass bed creation.
- From FY 2020, "Cradle of the Sea" Eelgrass bed creation activities were added to the menu of Fukuoka Support Donation, and donations for activities such as eelgrass bed creation were collected.



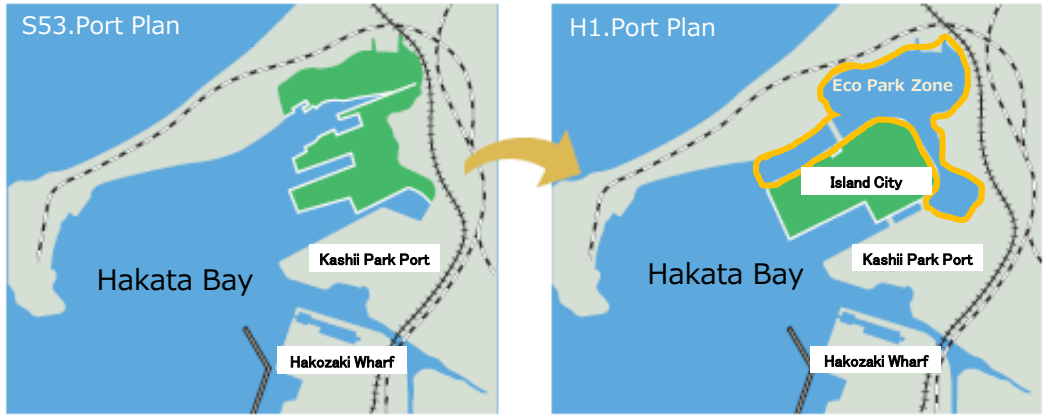
Basic Information

Region	Fukuoka City（Hakata Bay）
Participating organizations	Fukuoka City, Hakata Bay NEXT Conference
Start year	2020 Hakata Bay Blue Carbon Offset System,Hometown tax donation
Contents of activities	• Sowing eelgrass seeds and transplanting eelgrass sporophyte • Original credit system operation • Utilization of Fukuoka City hometown tax donation program • Environmental education and publicity
Site area	–
Amount of CO2 absorption	45.9t-CO2 （Hakata Bay Blue Carbon Offset System,FY2022:45.9t-CO2）

Background of Environmental Conservation and Creation Activities in Hakata Bay in Fukuoka City

To preserve the natural environment of the sea, coast, and Wajiro Tidal Flat in the eastern part of Hakata Bay, the reclamation plan was changed from a land-based to an island-style reclamation plan when the Hakata Port and Harbor Plan was revised in 1989. The 550-hectare area that was preserved named an “Eco Park Zone" and conservation activities were implemented.

In the Eco Park Zone, various efforts are being made to preserve the natural environment while taking advantage of the unique characteristics of each region. Since 2005, the creation of eelgrass beds has been implemented at Mishima Island, Wajiro Tidal Flat, and Uminonakamichi Zone to improve water and sediment quality and to create habitats for living organisms.



Environmental conservation practices carried out in the Eco Park Zone

Eelgrass Bed Creation

Eelgrass bed creation events are carried out using various methods according to the characteristics of the sea area and the age of the participants.

■ Seeding sheets on the seafloor

Divers placing seeding sheets on the seafloor

■ Seedling transplantation

Clipping eelgrass seedlings to chopsticks and planting them on the seafloor

■ Spraying seeds

Spraying eelgrass seed dumplings into the ocean

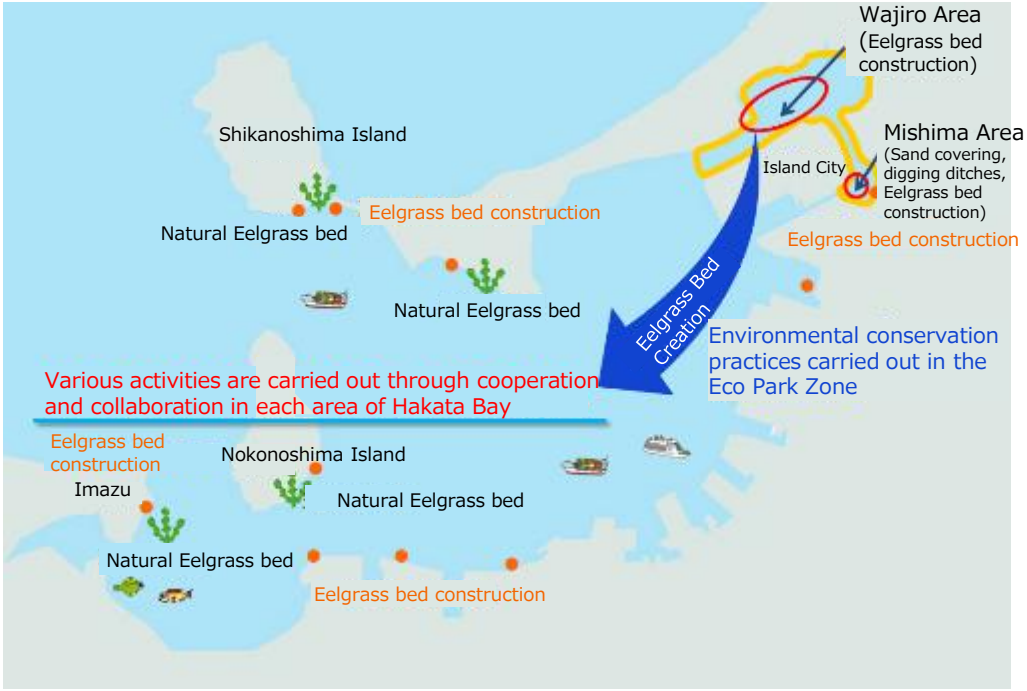
■ Eelgrass seedlings in pots

Environmental education classes at local elementary schools including lessons on how to grow eelgrass seedlings in pots

Establishment of Hakata Bay NEXT Conference

Hakata Bay NEXT Conference was established in May 2018 to promote initiatives for the entire Hakata Bay area by leveraging the strengths of organizations that have been implementing limited eelgrass bed creation in each area of Hakata Bay through networking.

Various activities such as network building and promotion of the attractiveness of the Hakata Bay are carried out with the aim of passing on the rich environment of Hakata Bay to the next generation through cooperation and collaboration among citizens, citizen groups, fishermen, businesses, schools, government agencies, and other diverse entities.



Networking

Promoting the beauty of Hakata Bay

Eelgrass bed creation

Civic events

○Members (As of September 31, 2023)

Locals, citizen groups, fishermen, businesses, schools, local government, etc.

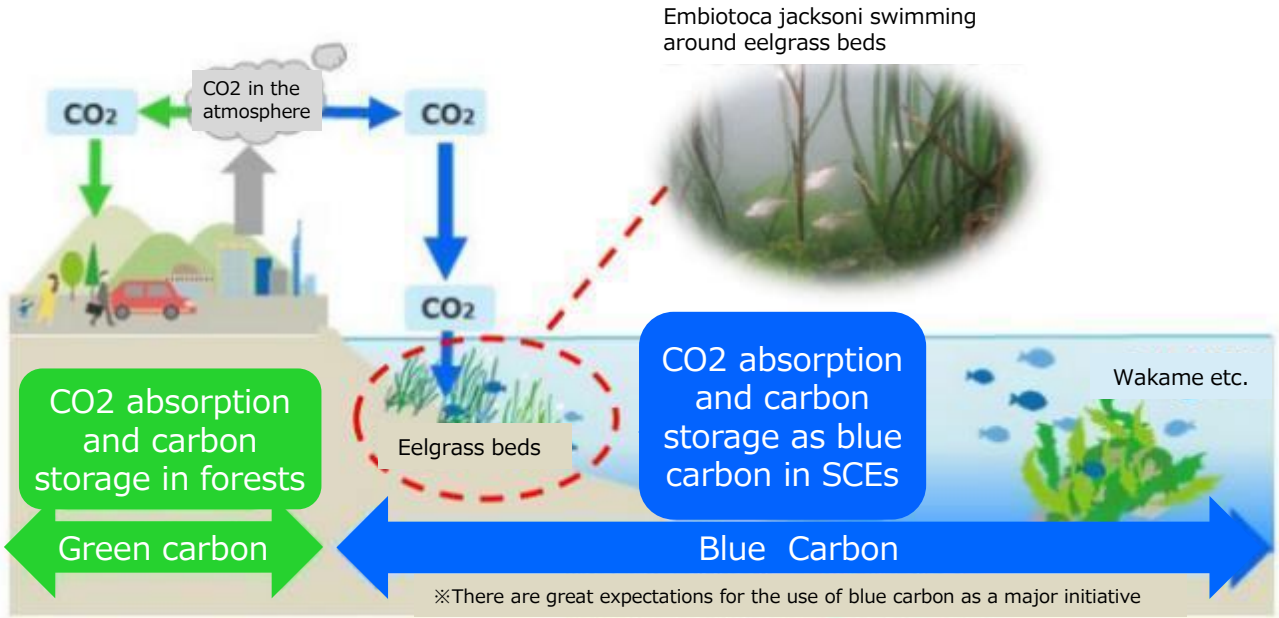
60 groups, 27 individual members

Hakata Bay Blue Carbon Offset System

Focusing on the value of eelgrass beds as a blue carbon ecosystem, the Fukuoka City Hakata Bay Blue Carbon Offset System was established in October 2020, allowing for the utilization of past initiatives to create eelgrass beds.

The amount of CO2 absorbed and fixed by eelgrass beds and other seaweed beds in Hakata Bay is converted into credits and sold as Hakata Bay Blue Carbon Credits.

Profits used to support the creation of eelgrass beds and other projects to preserve and create the environment of Hakata Bay.



■ Sales price

¥8,800/t-CO2（incl. tax） Minimum sales quantity ：0.1t-CO2

■ Carbon Offset Certification Achievements

Sold out in CY2020～2022!

FY	Number of sales	Amount of credit issued ($t\text{-}CO_2$)	Sales price（incl. tax）(¥)
2022	16	45.9	403,920
2021	21	48.5	426,800
2020	35	43.4	381,920

FUKUOKA CITY 博多湾ブルーカーボンオフセット

Fukuoka City Hometown Tax Donation Program

In 2020, “Cradle of the Sea” eelgrass bed creation activities were added to the menu of Fukuoka Support Donations, and donations were collected.

■Donations

FY	Donation amounts(¥)
2022	2,419,507
2021	990,000
2020	359,999

■Utilizing the donations

For projects to preserve the environment of Hakata Bay, such as eelgrass bed creation activities

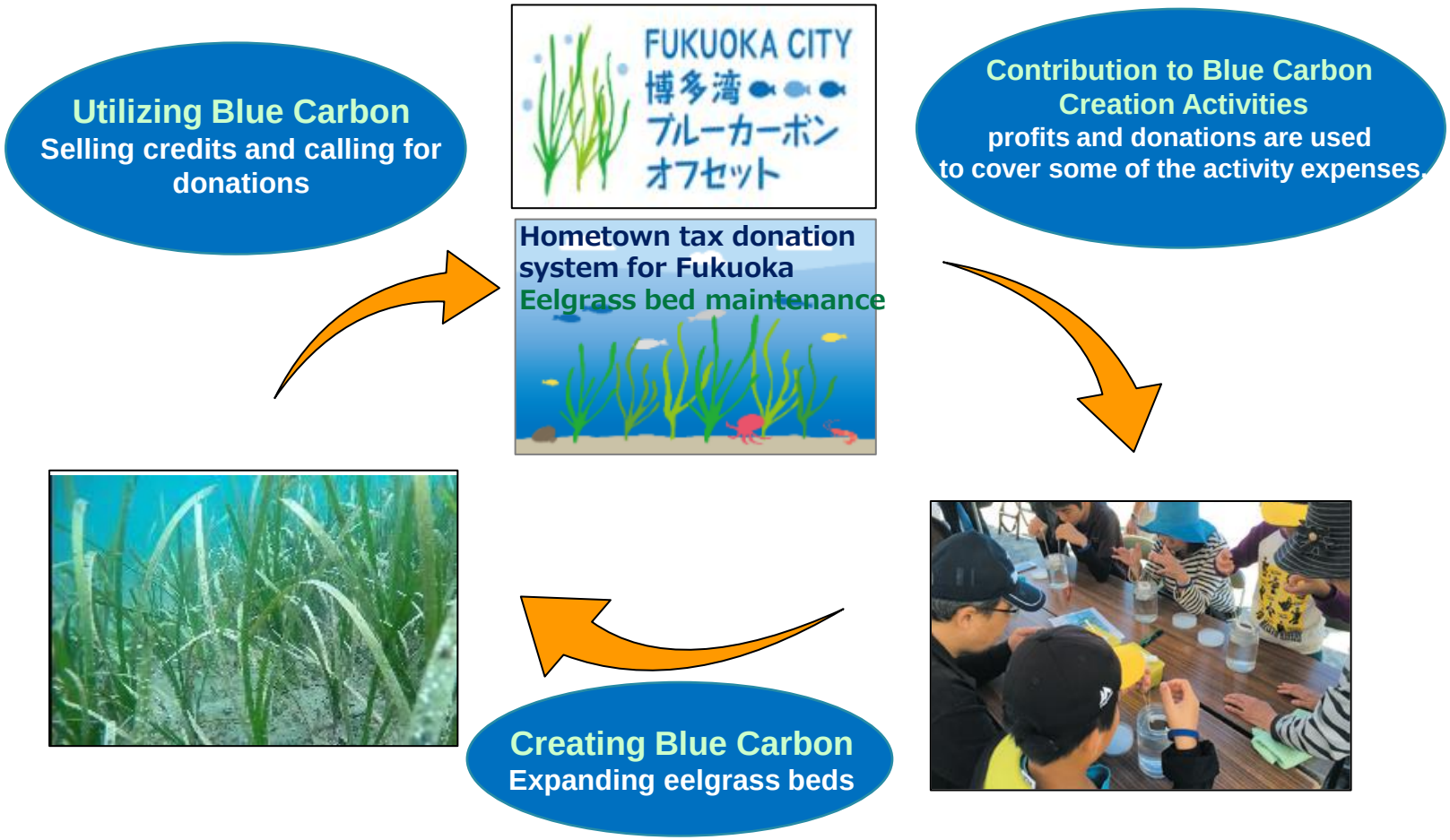

Eelgrass beds on Nokonoshima Island photographed by drone


Expansion of eelgrass beds


Eelgrass bed creation (transplanting seedlings)

Future Initiatives

Promoting activities to create eelgrass beds in Hakata Bay in cooperation and collaboration with various entities to generate blue carbon and utilize the generated blue carbon as credits to further revitalize environmental conservation activities in Hakata Bay.



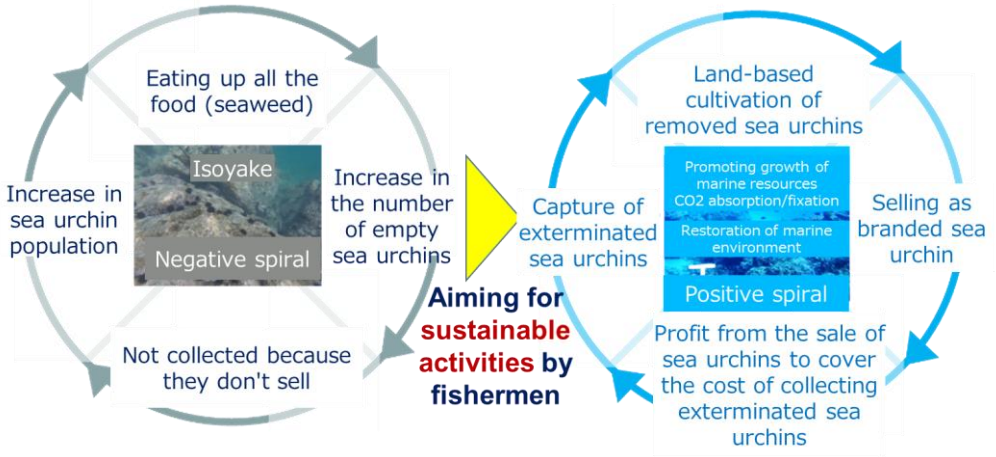
34 Munakata Sea Urchin Project (Munakata City)

Kyushu & Okinawa

Removing sea urchin, farming the removed juvenile sea urchins, and sell them as branded sea urchins, as a measure to combat isoyake.
The revenue from sales are reinvested into covering the removal expenses.

Overview

- In the Genkai Sea off Munakata, sea urchins have been causing significant damage to seaweed, leading to severe isoyake.
- Sea urchins, the cause of the phenomenon, had little flesh and were not marketable, so their proliferation increased, worsening the problem.
- By exterminating the juvenile sea urchins and cultivating them on land, we aim to grow them as edible brand sea urchins and use the profits from the sales to cover the cost of catching the sea urchins.



Basic Information

Region	Munakata City
Participating organizations	Munakata City, TAKADA Co.,LTD., Munakata Fishing Cooperative Association, Kyushu University Faculty of Agriculture
Start year	2022
Contents of activities	• Removal of pests（sea urchins）
Site area	–
Amount of CO2 absorption	–

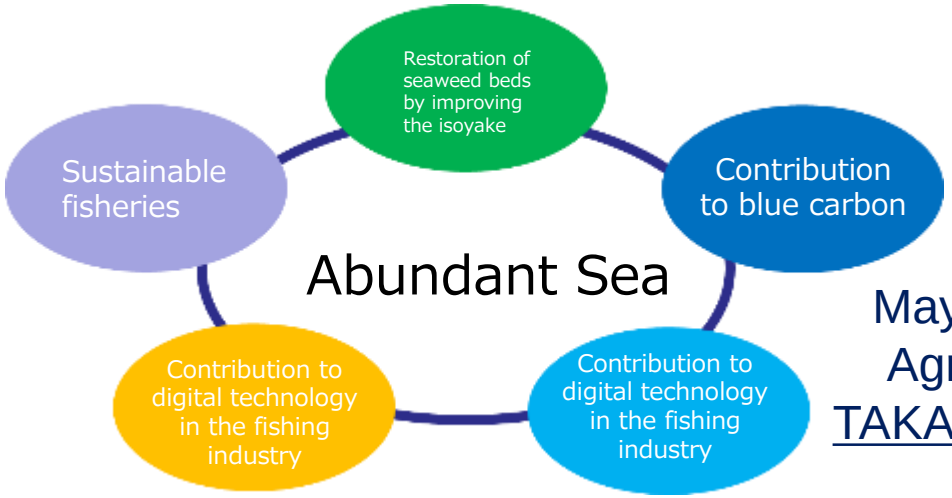
Save the Sea – Creating a Rich Ocean for the Future

Located between Fukuoka City and Kitakyushu City, Munakata City is rich in nature, facing Hibikinada and Genkainada Sea.
Seaweed beds support an abundant fishing ground.
Munakata City is said to be the last sanctuary in Kyushu.

We want to protect this abundant sea and pass it on to the future.

To ensure that our activities do not end up being transitory, we will work together with local communities to ensure sustainable efforts.

It is precisely because we live in a world of rapid changes
that we are beginning to take on new **challenges**.



- SDGs through cross-industry collaboration -

May 27, 2022, Munakata City SDGs Cooperation Agreement on the Creation of an Abundant Sea
TAKADA × Kyushu University × Munakata Fisheries Cooperative × Munakata City

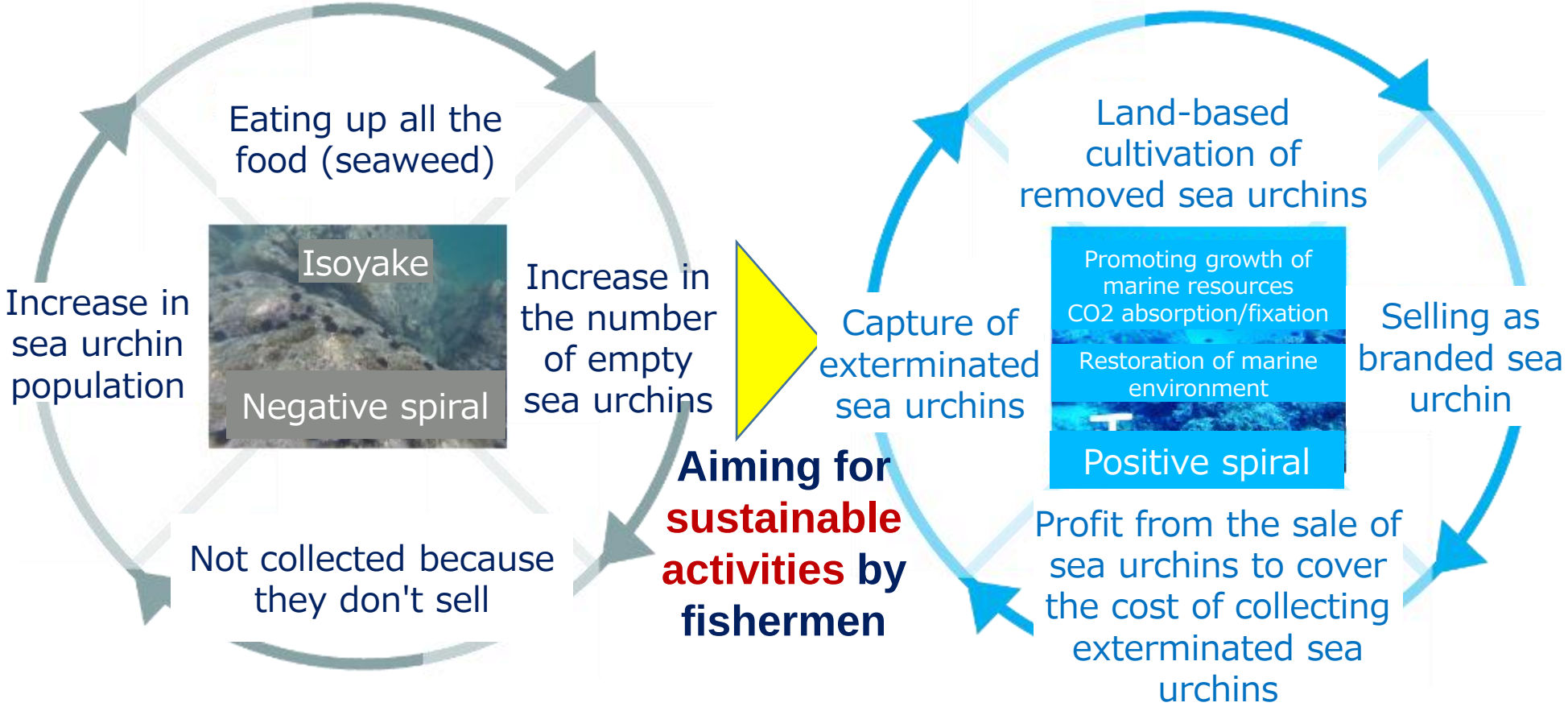
Land-based Cultivation of Removed Sea Urchins as a Countermeasure against Isoyake

What is isoyake?

A phenomenon in which seaweed is significantly reduced or eliminated in coastal waters

Causes of isoyake

- **Feeding damage by sea urchins and other algae-eating organisms, oligotrophication due to changes in ocean currents, etc.**



Restoring the world's oceans while protecting the last sanctuary

FY2022

TAKADA **Verification project on which bait is used to cultivate tasty sea urchins**

Kyushu University

Kelp waste ← 資さんうどん

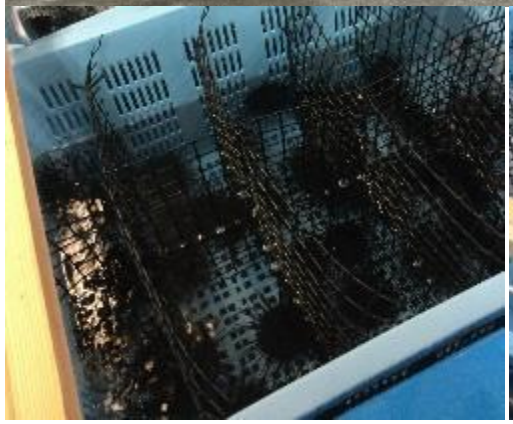
Vegetable waste ← Grano 24K ぶどうの樹

Bamboo Shoots waste ← 合馬観光たけのこ園 Oma Bamboo Grove Park

Sea urchin flesh is scarce due to lack of feed

Sea urchin cultivated for 3 months

FY2023 Verification experiment in an experimental facility (closed circulation facility)



Sea urchin cultivated for 4 months

Seaweed bed creation project

Photo by: Shakotan Town

(1) Kelp aquaculture: Results of verification

(2) Making sea urchin shell compost material

We are now moving toward the initiation of a verification test for the effective use of discarded **sea urchin shells**.

Munakata Sea Urchin Project

Cuisine for customers (limited edition)

SDGs Study on Oceans at Elementary School

- Let's protect the Genkai Sea! Munakata Sea Urchin Project -

In pursuit of achieving a sustainable society that preserves the rich nature at Genkaihigashi Elementary School and fostering an attachment to their hometown Genkai, as the first initiative in the city's primary and middle schools, they integrated the 'Munakata Sea Urchin Project' as educational material and engaged 19 fifth-grade students in learning about the marine environment. This involved lessons related to the Munakata Sea Urchin Project, dissecting sea urchins, follow-up lessons, and tasting sea urchin rice.

35 Initiatives for Marine Environment Conservation Using Seaweeds by Signing the Blue Carbon Agreement (VENTUNO Co.,Ltd.)

Kyushu & Okinawa

Blue carbon agreement signed between cosmetics manufacturer and fishery cooperative. Promoting product development using partly disposed mekabu and contributing to the conservation of the local marine environment and industrial promotion.

Overview

- The number of fishermen who grow seaweed has been decreasing year by year, and the scale of seaweed cultivation has also been shrinking. With the realization of the decline in seaweed beds, and the marine environment being affected by rocky-shore denudation, an agreement on “Regional Contribution in Promoting Blue Carbon” was signed between Ventuno co., ltd. and Japan Fisheries Cooperatives Itoshima with the cooperation of Itoshima City in June 2021.
- Continuously purchasing partially discarded mekabu from Japan Fisheries Cooperatives Itoshima under a five-year plan to help stabilize the income of wakame seaweed farmers and improve the efficiency of wakame production.

Basic Information

Region	Itoshima City (Fukuoka Pref.), Ishigaki City (Okinawa Pref.)
Participating organizations	Ventuno Co., Ltd. Japan Fisheries Cooperatives Itoshima Itoshima City Kyusyu University
Start year	2021
Contents of activities	• Okinawa mozuku cultivation • Environmental education and public awareness (corporate education)
Site area	–
Amount of CO2 absorption	–

Ventuno's Environmental Initiatives (Ishigaki Mozuku Seaweed Farming, Agreement with Japan Fisheries Cooperatives Itoshima)

Blue Carbon Agreement with Japan Fisheries Cooperatives Itoshima for Marine Environmental Conservation Using Seaweed

☑ Okinawan mozuku cultivation at the company‘s marine farm on Ishigaki Island

- We have our own marine farm on Ishigaki Island, Okinawa, where we cultivate Okinawa mozuku, the raw material for the fucoidan used in our products.
- During the harvest season, our employees work on the harvest and visit the farm to raise awareness of sustainable management and efficient use of natural resources, as well as ocean conservation efforts.

☑ Blue Carbon Agreement with Japan Fisheries Cooperatives Itoshima

- In June 2021, we signed a "Regional Contribution Agreement for the Promotion of Blue Carbon" with Japan Fisheries Cooperatives Itoshima under the leadership of Itoshima City.
- Continuously purchasing wakame seaweed from Japan Fisheries Cooperatives Itoshima under a five-year plan, contributing to stabilizing the income of wakame seaweed farmers and improving wakame seaweed production efficiency, thereby contributing to the sea and industry in Itoshima.
- We will also work on the SDGs, aiming to reduce CO2 emissions and solve environmental problems such as isoyake (rocky-shore denudation) rocky-shore denudation by connecting to the promotion of blue carbon.

Blue Carbon Agreement with Japan Fisheries Cooperatives Itoshima

Organization Overview

Japan Fisheries Cooperatives Itoshima
Fishery cooperative covering the whole Itoshima City
Area famous for oysters

VENTUNO Co.,Ltd.
Based in Fukuoka City, selling cosmetics and health foods

Business concerning blue carbon

Partnership between Ventuno and Japan Fisheries Cooperatives Itoshima

- Regional Contribution Agreement signed to promote Blue Carbon （5 years from 2021）
- Ventuno signed an agreement with Japan Fisheries Cooperatives Itoshima as a partner to promote the development of cosmetics using local wakame seaweed
- Fishery cooperatives also intend to contribute to **countering global warming**.

Source：PRITIMES

Wakame seaweed aquaculture

- **Wakame aquaculture is in decline,** and Fishery Cooperative aim **to increase unit prices and establish sales channels** through collaboration with Ventuno
- Expecting that this will lead to a recovery in catches and an increase in the number of producers
- There is also expect that Blue Carbon will **attract name recognition** and **improve the brand**.

- Although production is expanding for use in cosmetics, wakame production volume is not as high as expected due to **weather and labor shortages**

Developed two cosmetics using wakame seaweed

- Developed two cosmetics using wakame seaweed supplied by Japan Fisheries Cooperatives Itoshima（Pics on the right）
- Offered as a return gift for Fukuoka City **Hometown Tax Donation Program,** contributing to the promotion of the region's attractiveness

- Using seaweeds such as wakame to increase the area of wakame aquaculture trying to make a positive impact on fish and shellfish

(Source) Ventuno Website

Blue Carbon Agreement with Japan Fisheries Cooperatives Itoshima

Ventuno Co., Ltd. makes effective use of resources within the region by using disposed mekabu (root part of wakame seaweed) as a raw material for cosmetics, collaborating with Japan Fisheries Cooperatives Itoshima's wakame seaweed cultivation.

Logic model of Japan Fisheries Cooperatives Itoshima and Ventuno's work

Input	Activity	Output	Outcome		Impact
			Short-term	Mid-term	Long-term
Japan Fisheries Cooperatives Itoshima Ventuno Kyushu Univ. **Human resources**	Wakame seaweed aquaculture	**Utilization of mekabu Just under 1t**	Climate change・biodiversity GHG absorption Seaweed bed restoration	Measures for gloal warming/natural resources Reducing GHGs from natural sources Improving biodiversity Maintaining ecosystem services Promoting Blue Carbon	**Mitigating global warming**
Fishermen's boats Research facilities **Resources**	Development of cosmetics using mekabu	**Sales of cosmetics** using mekabu produced in Itoshima	Local economy Hometown tax donation system Synergies in collaboration	Fishery resources Expansion of wakame seaweed production Recovery of sea bream stocks in Itoshima Making sargassum horneri and such as a specialty Synergy with oysters	**Sustainable fishery** **Improving fishermen's income**
R&D expenses **Capital**	Japan Fisheries Cooperatives Itoshima and Ventuno signed the agreement to contribute to local communities	5-year agreement to contribute to local communities	Fishery Wakame seaweed production expansion Launched aquaculture of Sargassum horneri etc. Recovery of fish and shellfish resources		
			Local society Industry-Academia Collaboration Spread of local production for local consumption	Local society/econnomy Raising the name recognition of cosmetics Deepening Collaboration Expanding collaboration with research institutions Revitalizing local communities	**Sustaining Communities**

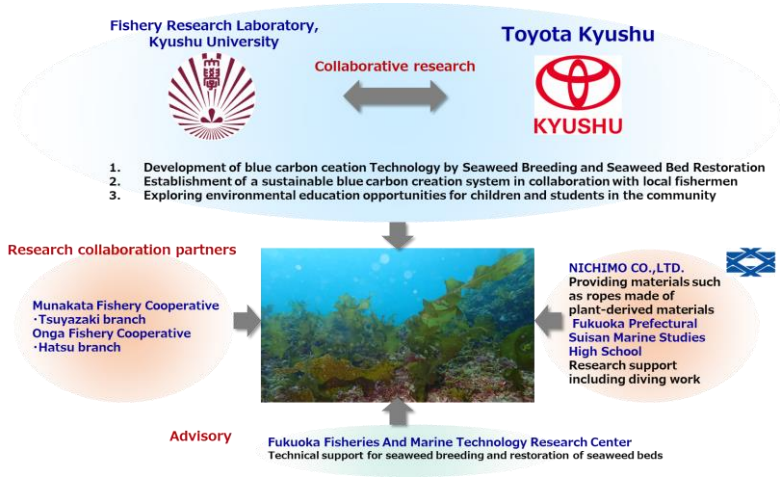
36 Joint research for blue carbon creation (Toyota Motor Kyushu Corporation)

Kyushu & Okinawa

Aiming to achieve carbon neutrality in the factory, creation of blue carbon through seaweed cultivation is initiated. A collaborative research effort involving companies, universities, fisheries cooperatives, the Fisheries and Ocean Technology Center, and fisheries high schools.

Overview

- Creating blue carbon by cultivating seaweed beds to achieve carbon neutrality in the factory
- Addressing the increase of isoyake in seaweed beds and promoting joint research with the Kyushu University Fishery Research Laboratory, which has the knowledge and technology for seaweed cultivation and seaweed bed restoration
- Aiming to establish a sustainable system to create blue carbon in collaboration with local fishermen



Basic Information

Region	Fukutsu City,Okagaki Town
Participating organizations	Toyota Motor Kyushu Corporation, Fishery Research Laboratory, Kyushu University, Munakata Fishery Cooperative Tsuyazaki branch,Onga Fishery Cooperative Hatsu branch, NICHIMO CO.,LTD.,Fukuoka Prefectural Suisan Marine Studies High School, Fukuoka Fisheries And Marine Technology Research Center
Start year	2023
Contents of activities	• Technology development(seaweed bed creation) • Environmental education and public awareness
Site area	More than 1,000ha
Amount of CO2 absorption	500～1,000t-CO2

Initiatives

- **Research on Seaweed Bed Restoration**

  While focusing on offsetting by blue carbon to achieve the factory’s carbon neutrality by 2035, recent tendencies show decline in seaweed and seaweed beds, which generate blue carbon, due to isoyake and other factors.
  Therefore, by conducting joint research with the Kyushu University Fishery Research Laboratory, which has the knowledge and technology for seaweed cultivation and seaweed bed restoration, the company aims to create more blue carbon and achieve carbon neutrality in the factory and a decarbonized society.

- **Establishing a System that Creates Sustainable Blue Carbon**

  The research field is the sea area managed by the Munakata Fishery Cooperative's Tsuyazaki Branch Office and the Onga Fishery Cooperative's Hazu Branch Office. The research is aim to develop technologies for seaweed propagation and seaweed bed restoration and to establish a system that creates sustainable blue carbon in cooperation with each fishery cooperative's offices and fishermen.

- **Fishery Promotion through Seaweed Bed Restoration**

  In addition to using a drone to survey the current state of seaweed distributions in the target area, ropes will be installed to nurture seaweed beds.
  Nichimo Co., Ltd., is providing ropes and other materials for the project, and Fukuoka Prefectural Fisheries High School sets ropes for cultivating seaweeds.

Implementation System of Initiatives

Fishery Research Laboratory, Kyushu University

Collaborative research

Toyota Kyushu

1. Development of blue carbon ceation Technology by Seaweed Breeding and Seaweed Bed Restoration
2. Establishment of a sustainable blue carbon creation system in collaboration with local fishermen
3. Exploring environmental education opportunities for children and students in the community

Research collaboration partners

Munakata Fishery Cooperative
・Tsuyazaki branch
Onga Fishery Cooperative
・Hatsu branch

NICHIMO CO.,LTD.
Providing materials such as ropes made of plant-derived materials

Fukuoka Prefectural Suisan Marine Studies High School
Research support including diving work

Advisory

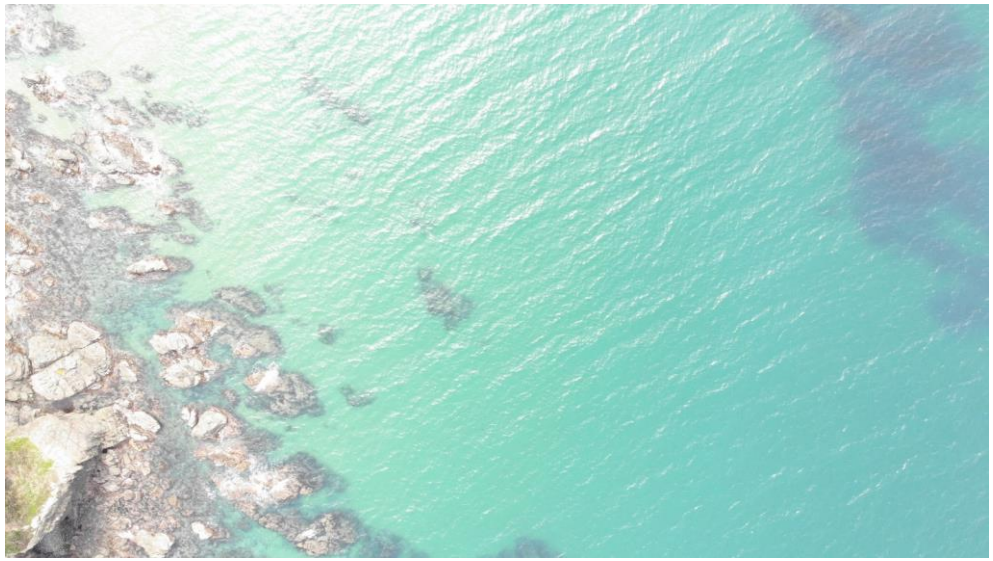
Fukuoka Fisheries And Marine Technology Research Center
Technical support for seaweed breeding and restoration of seaweed beds

Role in this project

Kyushu University Fishery Research Laboratory	• Basic research on blue carbon creation, including seaweed propagation and seaweed bed restoration • Environmental education opportunities for local elementary, junior high, and high school students using the content of the research
Toyota Kyushu	• Fieldwork and technology development for social implementation using the results of basic research at Kyushu University Fishery Research Laboratory • Sharing research results and technologies with local fishermen • Environmental education opportunities for local elementary, junior high, and high school students using the content of the research

Aerial photographs

Photo taken by aerial drone(Hatsu, Okagaki Town, Fukuoka Prefecture)



37 Seaweed bed creation project using J Blue Concrete blocks (Electric Power Development Co., Ltd.)

Kyushu & Okinawa

Concrete substitute material developed from coal ash and copper slag ("J Blue Concrete"), which can reduce CO2 emissions during block production and improve the effectiveness of seaweed bed creation.

Overview

- J Blue Concrete made mainly from coal ash and copper slag was developed for use in offshore construction projects.
- J Blue Concrete is a concrete substitute material that aims to realize a so-called blue-gray hybrid infrastructure that not only improves the gray infrastructure function by making it denser and heavier, but also enhances the effect of seaweed bed creation.
- The material has been used for repair and reinforcement of seawalls since 2016 and is currently already in the practical stage. It is expected that continuous use will create seaweed beds.

Basic Information

Region	Kitakyushu City
Participating organizations	Electric Power Development Co., Ltd. Wakamatsu Operations & General Management Office/ Chigasaki Research Institute
Start year	2015:laboratory tests,prototype block installations 2016～:J Blue Concrete has been used in the repair and reinforcement of seawalls
Contents of activities	• Installation of blocks or other substrate • Technology development (Development of J Blue Concrete)
Site area	Approx. 9.3 million m3 (Around sea area final disposal sites,1.2㎞×1.0㎞)
Amount of CO2 absorption	26.1t-CO2 (J Blue Credit, FY2021:15.6, FY2022:10.5t-CO2)

Project Details of Development and Use of J Blue Concrete Toward Social Implementation

- In 2015, laboratory tests started in order to evaluate the strength, durability, and environmental safety of concrete material. After prototype block installations, no issues were found confirming the possibility of installing in actual sea.
- Since 2016, J Blue Concrete has been used in the repair and reinforcement of seawalls. 4 m3 size blocks as much as 1,780 blocks have been used to date and are already in the practical stage. In addition, seaweeds (sea oak, ecklonia stolonifera, and sargasssum) are seen thriving every year since the blocks were installed.
- J Blue Concrete is a material with a large unit volume weight, which not only improves the stability of wave dissipating blocks, but also provides good seaweed attachment performance (realization of blue/gray hybrid infrastructure). In addition, the material-derived CO2 intensity is small (approx. 90 kg-CO2/m3) due to reduced cement use, resulting from the use of large amounts of by-products, so not only blue carbon (CO2 absorption) but also the material itself can be expected to reduce CO2 emissions.
- In response to a request from Queensland, Australia, where the Brisbane Olympics (Carbon Neutral Games) are scheduled to be held, a cooperative study is underway within Queensland.
- Continuous efforts are being made to create blue carbon and reduce CO2 emissions from materials using man-made structures (blocks) used for port and fishing port development.

J Blue Concrete Blocks

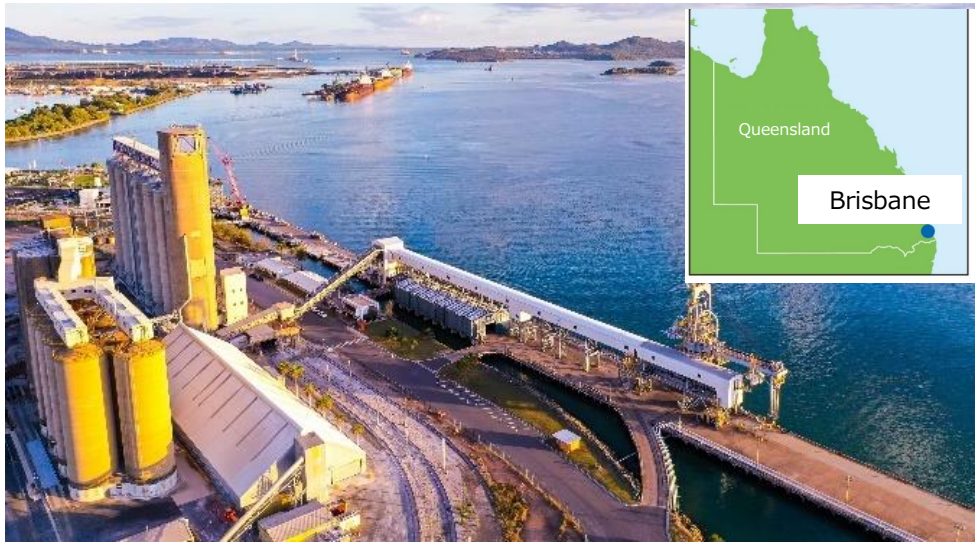


Image of port facilities
(Image provided by Trade and Investment Queensland)

Overview of J Blue Concrete

J Blue Concrete = Copper slag + Coal Ash + Cement + Seawater

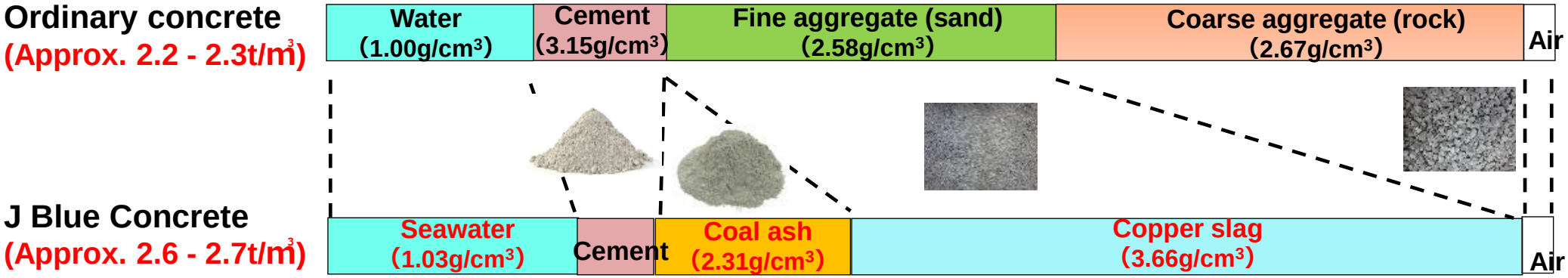
・Copper slag: byproduct of copper smelting (slag); large density (3.6 g/cm^3)

・Coal ash: By-product of coal-fired power plants (ash particles generated by coal combustion)

*Both substances are off-specification products, contributing to the expansion of by-product utilization and cost reduction.

● Features of J Blue Concrete

- **Heaviness**
  - ➡ Approximately 20% heavier than ordinary concrete
- **Low carbon**
  - ➡ Material-derived CO2 intensity is lower than that of ordinary concrete, at about 90 kg-CO2/m^3.
- **Low cost**
  - ➡ Approximately 20% cheaper than ordinary concrete



*Because wave-dissipating blocks are unreinforced, the use of seawater in their manufacture is expected to lead to early strength development and a reduction in cement.

Low Carbon Characteristics of J Blue Concrete

−Material-derived CO2 intensity−

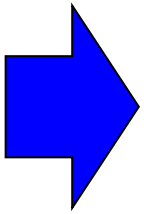
J Blue Concrete Mix Example

Water-binder ratio (%)	Water-cement ratio (%)	FA replacement ratio (%)	Unit weight (kg/m³)				Air (ℓ)	Unit volumetric mass (kg/m³)	Unit paste amount (ℓ)
			C	FA	CUS	W			
36	119	70	202	471	1,726	240	20	2,638	508

CO_2 Emission Intensity

Material	CO2 emissions per ton (kg)
Ordinary Portland cement	766.6
Blast furnace cement Class B	437
Copper slag	0
Coal ash (unrefined)	0
Fine aggregate	3.7
Coarse aggregate	2.9

＊CO2 emission intensity of Copper slag and coal ash are considered as 0, due to being off-specification products



● **Ordinary ready-mixed concrete**

Approx. 270 kg-CO2 / m³

● **J Blue Concrete (Blast furnace cement Class B)**

Approx. 90 kg-CO2 / m³

(Approx. 67% reduction compared to ordinary concrete)

- **J Blue Concrete, a concrete substitute material, is a low-carbon material with a material-derived CO2 intensity of about 33%.**
  (Not only is CO2 absorption expected by blue carbon, but CO2 reduction of the material itself can be expected.)

Seaweed Attachment Effectiveness

Soon after placement (Oct.2015)

8 months passed

14 months passed

Soon after placement (March,2017)

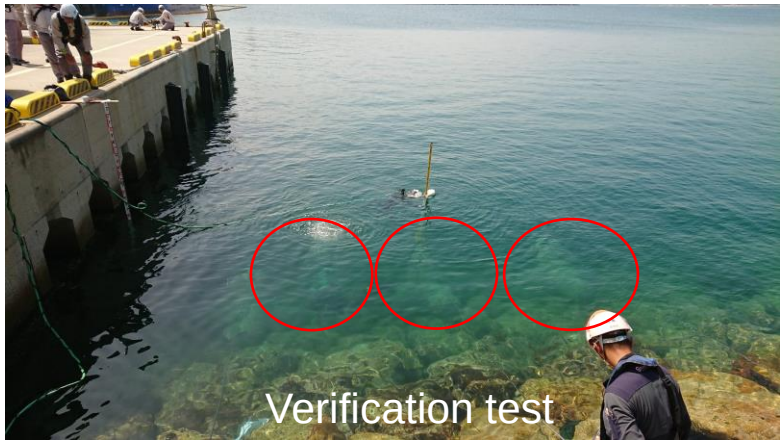
14months passed

49 months passed

Project to Improve Seaweed Attachment Effectiveness of J Blue Concrete

- In addition to the shallow water depths, the effect of seaweed attachment and growth has been confirmed at depths exceeding 10 m in the first year after installation of the blocks. Projects are ongoing to further improve seaweed attachment performance by improving the surface shape of the blocks since August 2023.
- Methods of processing block surfaces at low cost using standard formwork are also being exemined.

Installation Aug. 2023



38 Blue Carbon Initiatives in Karatsu City (Karatsu City)

Kyushu & Okinawa

Conducting wakame seaweed farming activities with a focus on marine education at elementary schools, as well as conducting classes on SDGs initiatives and carbon neutrality in collaboration with companies.

Overview

- Marine education is a thriving activity at the local Sashi Elementary School, and as part of the program, a wakame seaweed farming experience was conducted with the cooperation of local fishery professionals.
- SDGs initiatives and carbon neutrality classes were provided by companies and universities to deepen the significance of the activities for the students.

Basic Information

Region	Karatsu City
Participating organizations	Sashi Elementary School,Karafusa Research Group, Japan Airlines Co., Ltd. , Kyushu University,Karatsu City
Start year	2022
Contents of activities	• Wakame seaweed farming • Environmental education and public awareness • Beach clean-up
Site area	–
Amount of CO2 absorption	–

Initiatives in Karatsu City (Sashi Elementary School 'Karafusa Research Group')

- Since 2022, as part of marine education at Sashi Elementary School, a wakame seaweed cultivation experience has been offered to 5th graders in cooperation with the Karatsu City Branch of the Saga Genkai Fisheries Cooperative and the Saga Prefecture Genkai Fisheries Promotion Center.
- In 2022, Karatsu City, Kyushu University, and Japan Airlines (JAL) became involved, adding environmental and career education content in addition to marine education.

【FY2022】

(1)Wakame seaweed planting【March】

(2) Wakame seaweed farming（sowing）activity【November】

①Lecture ●Let's learn about Wakame

●Let's learn about blue carbon

●Let's learn about JAL's works

②Wakame seaweed farming（sowing）activity

③Beach clean-up

(3) Wakame seaweed farming（harvesting）activity【February】

① Lecture ●Let's learn about JAL's SDGs commitments

●Let's learn about carbon neutrality

② Wakame seaweed farming（harvesting）activity

③ Beach clean-up

Initiatives(FY2022)

Wakame seaweed farming（sowing）activity, Nov. 2022

Lecture

▲JAL Ground crew
“Let’s learn about JAL’s SDGs commitments”

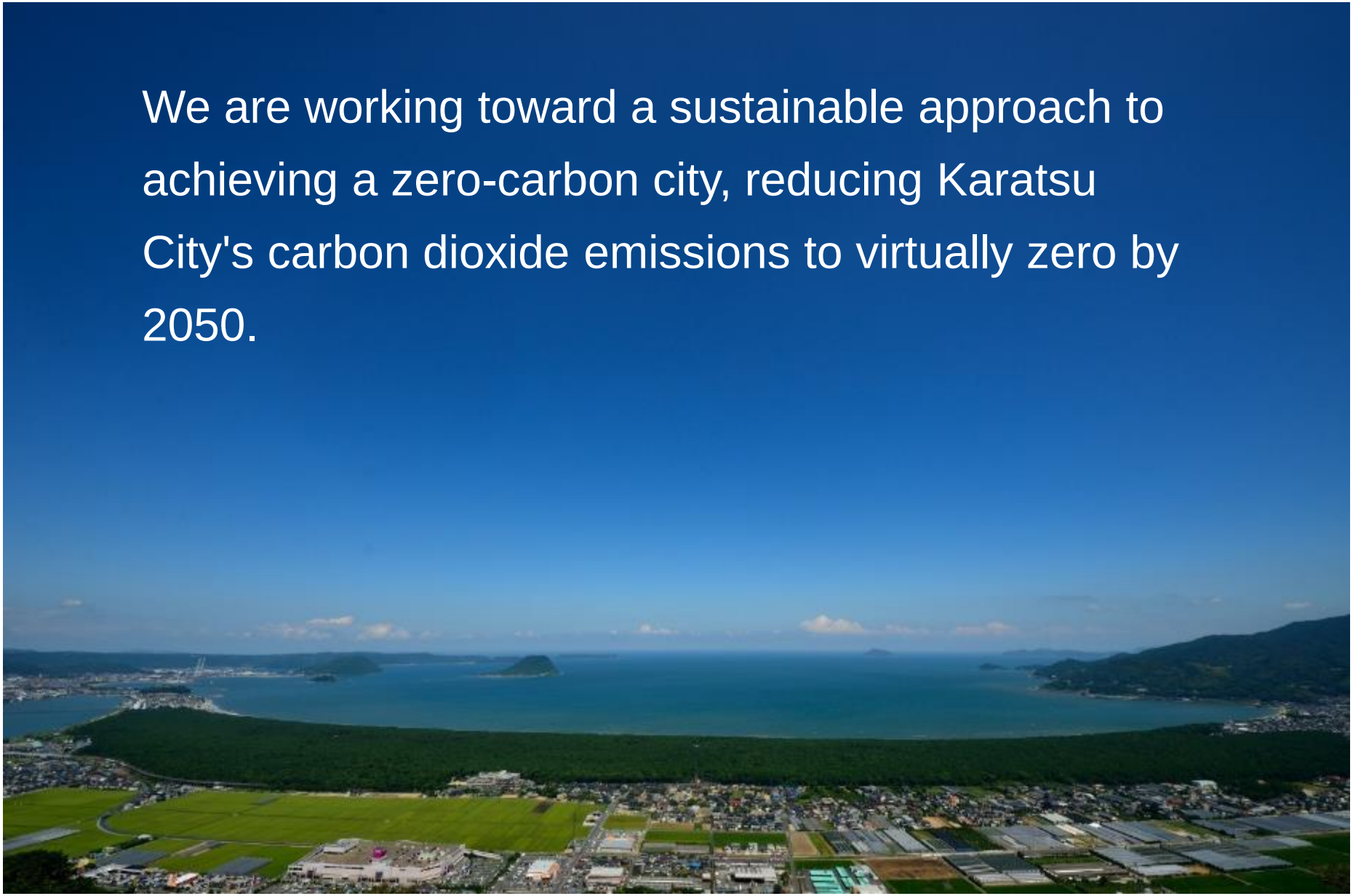
▲Kyushu Univ. Global Innovation Center Associate Prof. Hayabuchi
“Let’s learn about carbon neutrality”

Initiatives(FY2022)

Wakame seaweed farming（sowing）activity, Feb. 2023

Beach clean-up, Nov. 2022, Feb. 2023

Future Initiatives



39 Seaweed Bed Conservation Project (Saga Genkai Fisheries Cooperative)

Kyushu & Okinawa

Extermination of Japanese purple sea urchins and other creatures that feed on seaweed beds
Fishermen observe changes in the sea daily and respond quickly with solutions, as a core member of the project.

Overview

- The organizing parties are the ‘Association for Connecting the Kushiura Macroalgal beds to the Future’ and the Chinzeimachi Branch Office of the Saga Genkai Fisheries Cooperative.
- The main activity is the extermination of the *Diadema setosum* (long-spined sea urchins), which are harmful to the seaweed beds.
- Due to the decreasing number of fishermen, we are also considering to collaborate with general participants and companies.

Removing *Diadema setosum*

Basic Information

Region	Kratsu City
Participating organizations	Saga Genkai Fisheries Cooperative,The Association for Connecting the Kushiura Macroalgal beds to the Future
Start year	2001 Activity to removing predatory organisms to prevent isoyake
Contents of activities	• Removal of pests（sea urchins） • Environmental education and public awareness（environmental education at local elementary school）
Site area	–
Amount of CO2 absorption	41.1t-CO2 (J Blue Credit,2years from FY2021 to FY2022:41.1t-CO2)

Initiatives

- The Kushiura area of Chinzei Town, Karatsu City, Saga Prefecture, began to suffer from isoyake around 2001, and activities were initiated to remove the predatory organisms to stop the phenomenon.
- Through these proactive activities, isoyake has improved, and 11 hectares of seashore have been restored to its original state, where seaweed thrives.
- Furthermore, in May 2022, Association for Connecting the Kushiura Macroalgal beds to the Future was established, and not only has it been actively engaged in seaweed bed creation activities, but also in providing environmental education to local elementary school students.
- The seaweed beds are mainly made up of sargassum and sargassum horneri in the shallow areas and sea oak in the deep areas.

Association for Connecting the Kushiura Macroalgal beds to the Future

Image of an environmental studying class

40 Blue carbon initiatives incorporating our network as an offshore wind farm operator (INFLUX Inc.)

Kyushu & Okinawa

Promoting seaweed bed creation by offshore wind farm operators utilizing their community facilitation knowledge Implementing technological development for seaweed bed creation and seaweed bed surveys in cooperation with universities.

Overview

- Promoting seaweed bed creation by utilizing the network as an offshore wind farm operator and the ability to coordinate with local stakeholders, such as reflecting the opinions of local residents, as well as conducting verification of seaweed bed creation using reef blocks that utilize iron fulvic acid.
- With the consideration of establishing a seaweed bed sales company, the creation of "MOBA farm business model“ is under consideration in the area surrounding Kabeshima Island in Karatsu City, with the aim to creating job, creating original local products, and enhancing local brand power, as well as preventing isoyake.
- Developing seaweed bed technology and ROVs in collaboration with universities.

Basic Information

Region	Karatsu City, Tsushima City, Setana Town, Sado City, MiyakeVillage,Oshima Town
Participating organizations	INFLUX K.K. ,Saga Genkai Fisheries Cooperative, Tohoku University,Nagasaki University
Start year	2008
Contents of activities	• Installation of blocks and other substrates • Improvement of water sediment quality (laying of iron fulvic acid units) • Technology development (seaweed bed restoration technology, ROV)
Site area	180ha
Amount of CO2 absorption	–

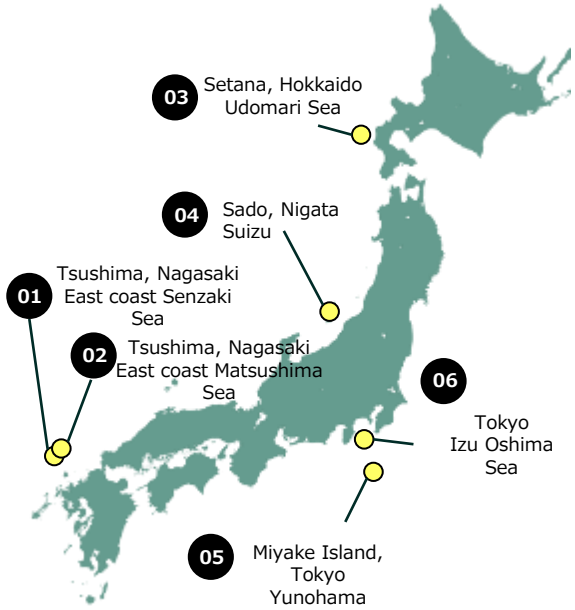
Previous Initiatives

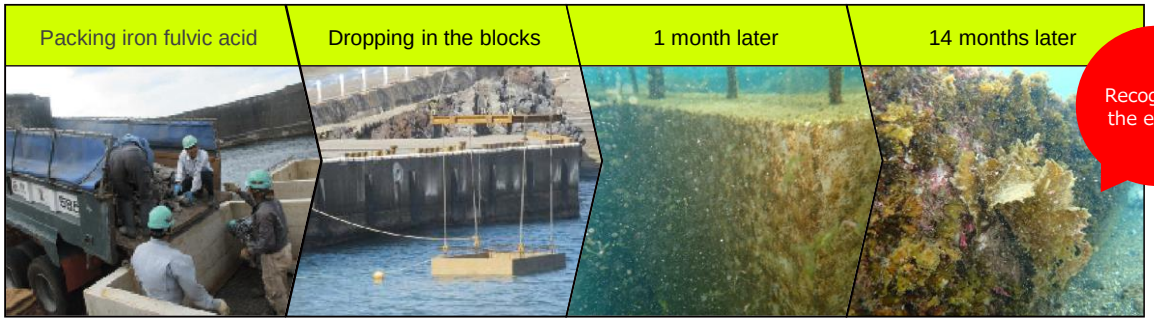
INFLUX has been conducting seaweed bed restoration activities using iron fulvic acid in various regions for more than ten years and has verified the effectiveness of such activities, taking advantage of its extensive experience and high coordination skills with local fishermen, local governments, and local residents in offshore wind power projects.

We have confirmed that seaweed bed restoration is closely related to forest ecosystems, and that the use of iron fulvic acid produced in forests can be expected to be effective.

In order to realize a self-sustaining blue carbon, we recognize the need to work closely with local communities to achieve wide-area and sustainable seaweed bed restoration that is in line with the local environment.

NO.	Location	Research period	Seaweed species (before the experiment)	Construction method
1	Tsushima, Nagasaki East coast Senzaki Sea	Sep, 2008 ～ Jan, 2010	*Sargassum ringgoldianum*・*Sargassum macrocarpum*	Shoreline reclamation
2	Tsushima, Nagasaki East coast Matsushima Sea	Sep, 2008 ～ Jan, 2010	*Sargassum macrocarpum*	Installation of gabion works
3	Setana, Hokkaido Udomari Sea	Jul, 2009～ Jul, 2011	*Polysiphonia* wakame	Shoreline reclamation
4	Sado, Nigata Suizu	Sep, 2009 ～ Oct, 2011	*Sargassum macrocarpum*・*Sargassum piluliferum*・*Sargassum patens*・*Sargassum siliquastrum*	Shoreline reclamation
5	Miyake Island, Tokyo Yunohama	Sep, 2009 ～ Jul, 2011	*Polyopes polyideoides*	Shoreline reclamation
6	Tokyo Izu Oshima Sea	Jul, 2019～ Nov, 2022	Family *Phyllophoraceae* etc.	Installation of seaweed bedding material





Packing iron fulvic acid in the reef blocks

Dropping the blocks in the sea, and observing the restoration process

Seaweed adhesion observed on reef blocks

Seaweed covering the surface of the reef block

[Results of a Verification Experiment in the Sea Area of Izu Oshima, Tokyo]
In the sea area of Sashikiji Fishing Port on Izu Oshima Island, Tokyo, seaweed reef blocks lined with iron fulvic acid units were placed in the sea for more than two years.
As the next step for INFUX, the MOBA farm vision was launched and is still ongoing.

MOBA farm business

INFLUX Vision for Seaweed Farm

Toward a healthy, self-sufficient Blue Carbon, we

① form a community which works hand in hand with the local society,

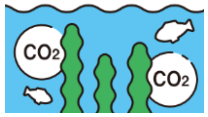
② carry out wide-area and sustainable restoration of seaweed beds, and

③ in harmony with the natural environment of the area

aiming to establish a seaweed farm that encompasses the creation of new businesses in coexistence with the local community with Blue Carbon at the core.

Eat CO2 and Contribute to the Planet !

We will not simply build seaweed beds for the purpose of improving isoyake but will build seaweed beds that will have many positive effects and invite a wide range of people to participate in the project.
We will expand regionally and nationally.



MOBA Farm

A farm that efficiently grows seaweed with a high CO2 fixation rate, commercializes the grown marine products, creates a circulating blue carbon ecosystem, and can offset CO2 in a stable way over a long period of time.

Countermeasure for isoyake	Improvement of isoyake, restoration of marine resources and marine environment
Restoration of seaweed beds	Maintaining and raising coastal industries, acquiring technology and establishing new business models, expanding and applying the model from the local to the national
CO2 fixation	Global warming countermeasures、Blue Carbon business establishment
Seaweed aquaculture	Developing health-conscious local products utilizing blue carbon ecosystems
Community symbiosis	Community revitalization, community activation

Engagement with Local Stakeholders

Blue Carbon network Partnership formation with local fishermen

/NFLUX/NC
(MOBA Solution Inc.)

Partnership

JF佐賀 げんかい JF SAGA GENKAI

Requests for participation

Research to expand utilization
Blue Carbon credit
Providing technology and materials

Local fishery companies
Local companies
(Blue Carbon offset)
School and civic groups
Local govt.

Aiming to collaborate with local governments in the future

Expected ripple effects (e.g.)

- **Based on the experience and knowledge of local fishermen, introducing a fish farm system that also prevents sea urchins from feeding on seaweed beds**
- **Job creation via fish farm business**
- **Creation of original local product**
- **Improvement of the local brand**

Discussions on seaweed bed restoration project with the area management association

Saga Genkai Fisheries Cooperative, Kabe Island Branch

- Breeding by seed fiber
- Growing seaweed by placing reefs
- Removal and aquaculture of edible sea urchins
- Removal of *Diadema setosum*

Saga Genkai Fisheries Cooperative, Yobuko Branch

- Aquaculture facilities for sea urchins (marine, field)
- Breeding by seed fiber
- Breeding elite seaweed
- Development of extermination equipment
- Artificial growth cycle plant

Survey of seaweed beds in cooperation with fishery cooperatives and Tohoku University

1st diving survey (May, 2023)

- Diving survey with exchanging opinions with local fishermen
- Water quality and temperature survey
- Identification of native seaweed species

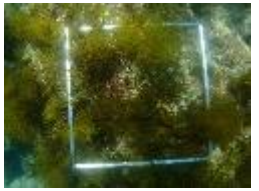
2nd diving survey (Sep, 2023)

- Making quantitative seaweed distribution MAP
- Creating a list of seaweed species that appeared
- Estimation of spore dispersal process by DNA analysis

Conducted tripartite consultation based on the survey results

・Allocation of sea areas for the project
・Determine the species to breed
・Determine the demonstration methods

Images



MOBA farm business model

MOBA Farm（Plan）

1st : Karatsu, Saga Kabe Island Sea
Aiming to actualize a seaweed farm, a detailed plan is being developed in cooperation with Tohoku University, based on the consent formation with the local fishermen.

Investment, Blue bond etc.

Pay back

Seaweed bed property management company

Operation

- Seaweed farm construction
- Lot sales (CO2 emission rights)

Merchandise

- Commercialization of seaweed, sea urchins, and other local marine resources
- Marketing
- Sales

Maintenance

- Manage/maintain seaweed farm
- Monitoring
- CO2 fixation quantification
- Predatory fish and sea urchin control

Lot sales

Value

CO2 emission rights
CSR/ISR, contribution

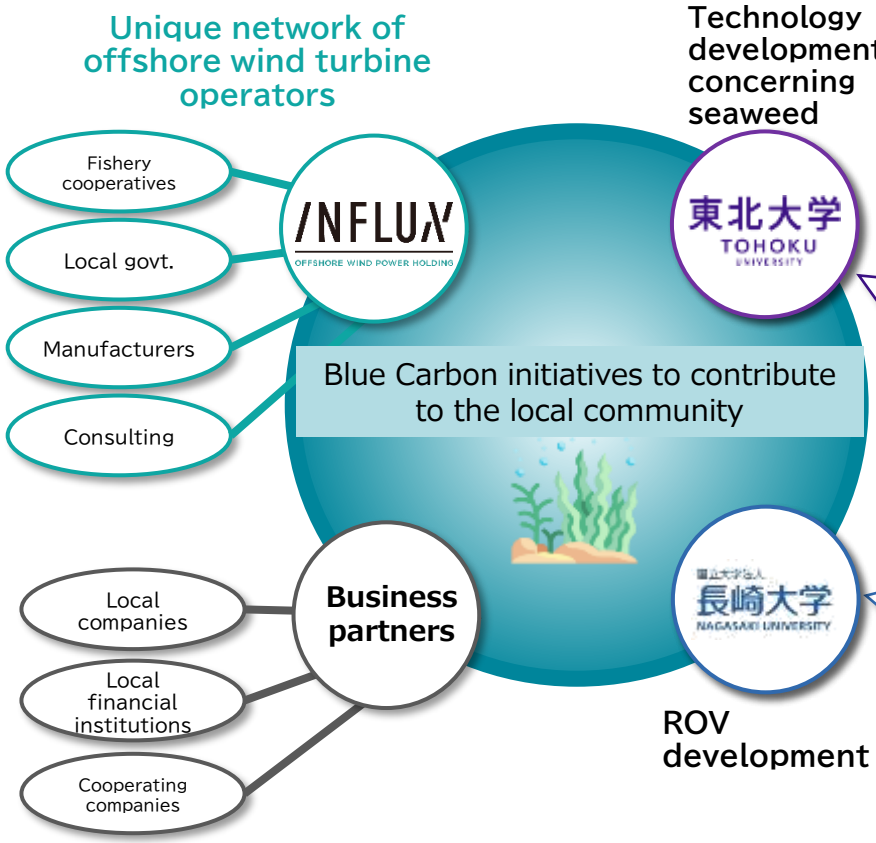
- Direct sales (Local govt.)
- Direct sales (companies, factories, warehouses)
- Direct sales (individuals)
- Indirect sales of surplus (market)
- Indirect sales of surplus (individuals)

Revenue

- **Seaweed sales**
- **Aquaculture sea urchin sales**
- **Other marine resources**
- **Donation**

Blue Carbon initiatives

- INFLUX is working on blue carbon initiatives that incorporate the network it has cultivated as an offshore wind power generation company.
- The company is already conducting joint research and development with universities, aiming to establish effective methods, including the development of species that can be applied to the rapidly changing marine environment.
- In the future, the company will also consider collaboration with local businesses and financial institutions and link its Blue Carbon initiatives to contributions to the local community.



”INFLUX Group launched the joint research on “seaweed beds restoration” with Prof. Aoki at Tohoku Univ.
They aim to improve the efficiency of "seaweed bed restoration methods" for the conservation of marine resources.

MOBA Solution Inc., a group company of INFLUX Corporation, and Tohoku University, a national university corporation, have signed an agreement to jointly research and develop efficient and applicable restoration methods and methods for "seaweed bed regeneration" to improve seaweed beds that play an important role in the conservation of marine resources. Professor Aoki of the Department of Aquatic Garden and Plant Ecology, Graduate School of Agricultural Science, Tohoku University and the university will develop the most efficient and effective "seaweed bed restoration method" that can be applied to different "seaweed bed" environments throughout Japan in the ever-changing natural environment, including the rising sea water temperature caused by global warming.

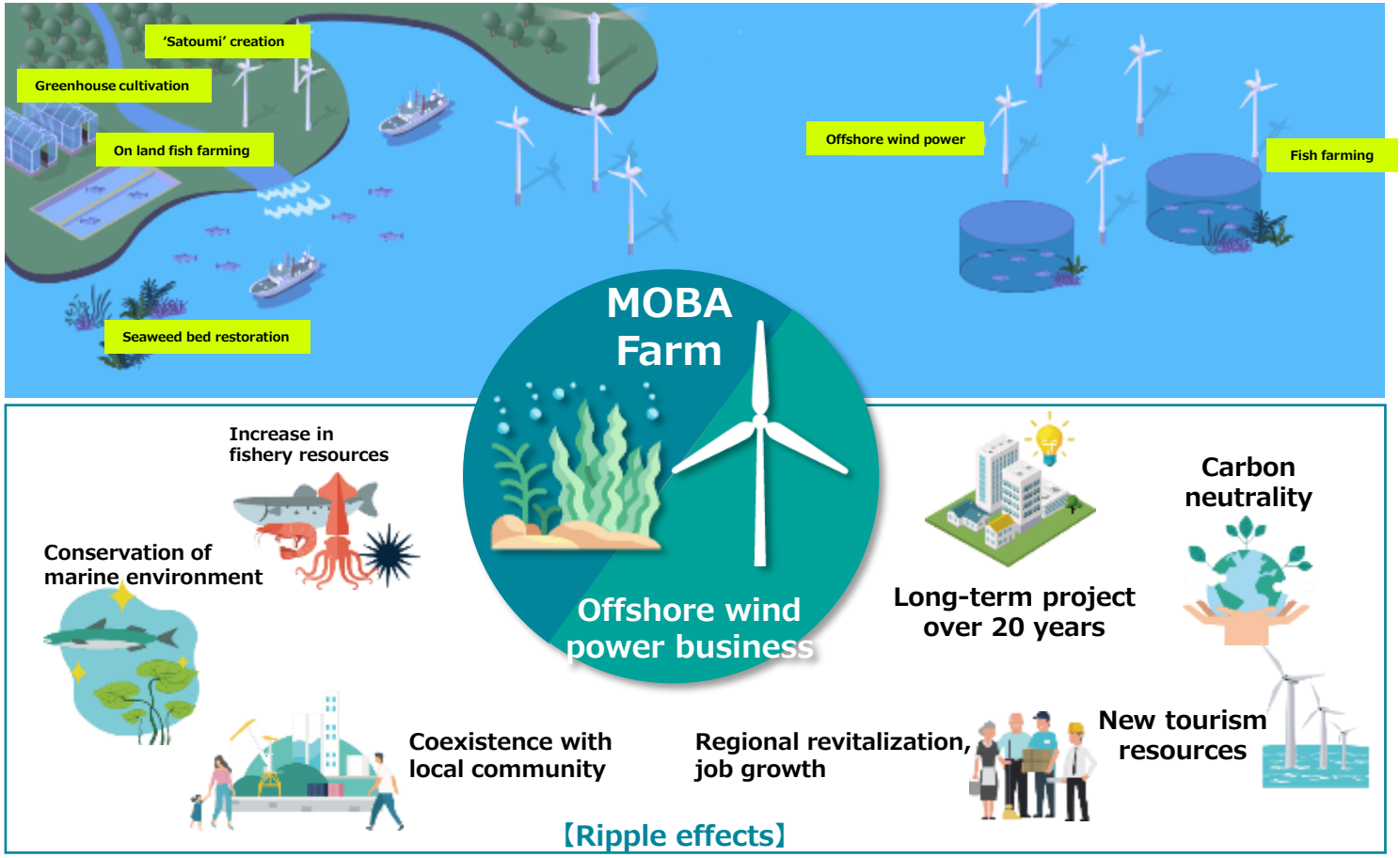
INFLUX OFFSHORE WIND POWER HD and Nagasaki University have entered an agreement for joint development of a next-generation "underwater robot (ROV)" for the development of a remotely operated unmanned submersible for the purpose of "visualizing the seafloor for seaweed bed restoration.”

INFLUX OFFSHORE WIND POWER HD will develop an "integrated underwater robot" combining an underwater camera and robot system in collaboration with Nagasaki University, conduct field tests in actual sea, verify operability and safety, and establish advanced underwater robot operation methods.

Cooperation with the Offshore Wind Power Project

The offshore wind project is a long-term project, spanning 30 years from the construction of the wind turbines to the O&M project and their removal.
By coexisting with the local community during the 30-year period, we can work together to create a vision for the future for the local community, the natural environment, the fishing industry, and the marine environment.

The MOBA farm project and the offshore wind power generation project have many in common, such as preserving the marine environment, increase in marine resources, and carbon neutrality, and the two projects can generate various ripple effects by working together.



41 Project to Promote Carbon Neutrality Using Seaweed beds (Goto City)

Kyushu & Okinawa

Developing the "Goto Model" to increase the probability of success in preventing isoyake, based on successful examples of seaweed bed restoration.
Expanding seaweed bed restoration activities to other areas.

Overview

- Goto City formulated an "Action Plan for Isoyake Countermeasures" in 2019 to address the issue of seaweed bed restoration over the long term and will work on the establishment of an organizational structure, implementation of seagrass bed restoration activities, and Goto's own credit certification system to further promote seaweed bed restoration measures.
- In cooperation with the private sector, the "Goto Model," a method of countermeasures adapted to the actual conditions of each region in the city, has been established.
- The Goto City Blue Carbon Promotion Council was established in 2021 as well as the “Isoyake busters“ organization to expand the "Goto Model" to other areas to increase the probability of success in preventing the phenomenon.

Spreading seaweed bed restoration activities to other areas

【Isoyake】

Application of Goto Model

Isoyake-busters

【Restoration of seaweed beds】

Basic Information

Region	Goto City
Participating organizations	Blue Carbon Promotion Council,Goto City
Start year	2019 Goto City formulated an "Action Plan for Isoyake Countermeasures"
Contents of activities	• Removal of pests • Technology development (Production and supply of seedlings)
Site area	5ha Targeted seaweed bed restoration area
Amount of CO2 absorption	12.1t-CO2 (J Blue Credit, FY2022:12.1t-CO2)

Initiatives

- **Goto City Action Plan for Isoyake Prevention (formulated in 2019, period: 2019-2029)**

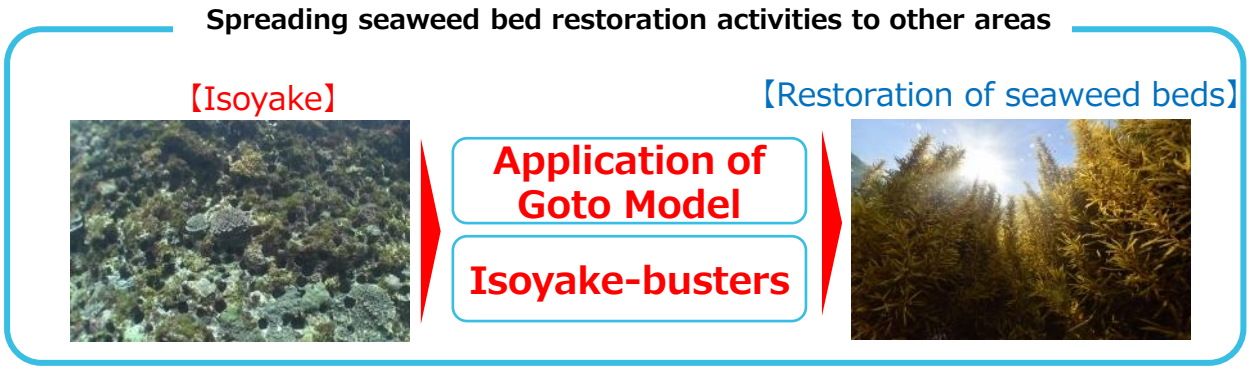
  Purpose: The project is working to preserve and restore seaweed beds along the coast of Goto and to investigate the causes of isoyake to develop Goto's fishing industry and to maintain and restore the coastal ecosystem.
  The plan is to restore 1.0 ha of seaweed beds in one area over five years, with the goal of restoring 5.0 ha of seaweed beds in five areas at the end of the project.

- **Commission for the Goto City Project for Comprehensive Measures to Restore Algae Beds, etc. (FY 2019-2021)**

  Purpose: To ensure the implementation of the "Goto City Action Plan for Isoyake Countermeasures," the "Goto Model" was established as a three-year project from FY2019 to FY2021 to promote the spread of seaweed bed restoration methods adapted to the actual conditions of each area in the city by publicly soliciting and implementing new seaweed bed restoration technologies of private companies and others and comprehensively verifying their effectiveness.

- **Establishment of the "Goto Model" for seawater treatment and development by the “Isoyake Busters".**

  Purpose: To increase the probability of success of the isoyake countermeasures, the "Goto Model" based on successful cases of seaweed bed restoration will be developed and laterally expanded to other areas, and the “isoyake busters," a group of volunteer fishermen with abundant knowledge and experience in extermination of sea pests in each area, will be formed to create a system to address isoyake prevention beyond the boundaries of each area.

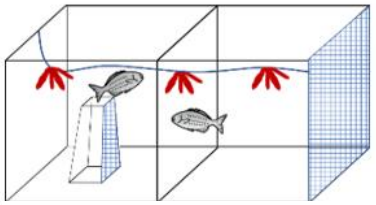


Establishment of the "Goto Model"

The "Goto Model" based on successful cases of seaweed bed restoration was developed.

Sakiyama Model

Measures for fish:
Technology to reduce predator feeding by partition nets and plant food fish traps



No effect on seaweed bed restoration with 2 traps

Adding more traps

Successful fish control if hijiki grows outside the net

Tamanoura Model

Measures for *Diadema setosum*:
Technology for restoring seaweed beds without the use of measures for fish

Search for waters with environmental characteristics similar to Tamanoura Bay

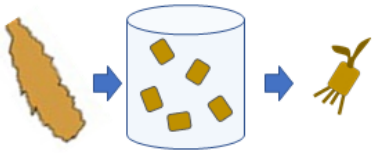
Adjustment of sea urchin density and supply of mother algae

Verification of seaweed bed restoration

Seedling Production Model

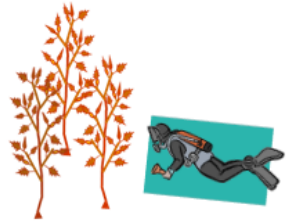
Testing the potential of introducing technology to provide a stable supply of seedlings.

・Successful mass production trials of hijiki seedlings
・Establishing a supply network for sporophyte



Indoor culture of finely cut leaf fragments

Supplying large quantities of embryos to the actual sea area (seedling planting)

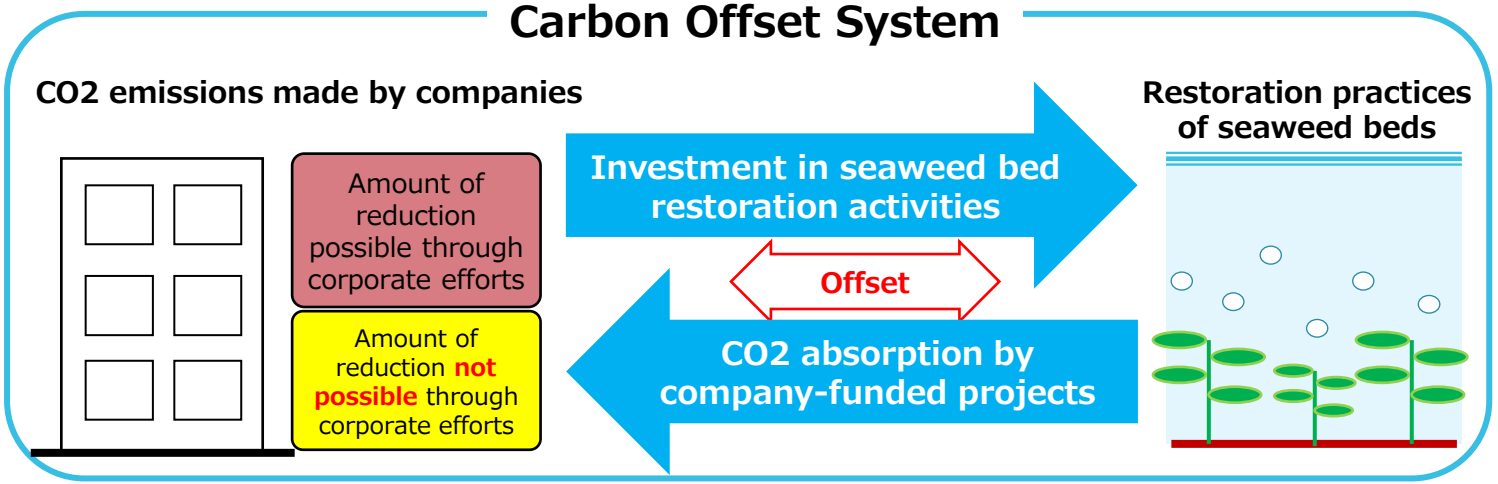


Monitoring the restoration of seaweed beds

Carbon Offsetting

To further promote countermeasure for isoyake, we will work on the establishment of an organizational structure, implementation of seaweed bed restoration activities, and the establishment of the city's original credit certification system.

- **Establishing an organization for Blue Carbon promotion**
  In October 2021, the Goto City Blue Carbon Promotion Council was established. The members of the Council consist of research institutes, fishermen, three fishery cooperatives in the jurisdiction, and Goto City.
- **Survey and research by Blue Carbon promotion organizations**
  Conducting research on the status of seaweed beds in the city, identifying issues in promoting CO2 reduction, and conducting surveys and research activities.
- **Establishment of Blue Carbon Offset System**
  Aiming to establish a credit certification system that offsets CO2 emissions, which cannot be reduced through corporate efforts, by investing in seaweed bed restoration activities.



Result（FY2021 Seaweed beds area）

No.	District	Place name	Distance（m）	Width（m）	Area（㎡）	Area（ha）	Major species of seaweed	Source
1	Tamanoura	Shimayama jima Iland (south coast) Kasagami Bettoki	960 354 720	7 7 7	6,720 2,478 5,040	0.672 0.247 0.504	*Sargassum piluliferum* *Sargassum horneri*	Report from Institute of Rocky Shore Environment and Resources
2	Kishiku	Mizunoura Bay	563	34.5	19,423	1.942	*Sargassum piluliferum* *Sargassum horneri* *Undaria pinnatifida* (wakame)	Report from Institute of Rocky Shore Environment and Resources
3	Sakiyama	Around Sakiyama Port			16,085	1.608	*Sargassum fusiforme*(hijiki)	Measurement by drone photography
Total						4.973		

No.	District	Place name	Distance（m）	Width（m）	Area（㎡）	Area（ha）	Major species of seaweed	Source
1	Tamanoura	Shimayama jima Iland (south coast) Kasagami Bettoki	961 399 714	39 20 41	37,479 7,980 29,274	3.748 0.798 2.927	*Sargassum piluliferum* *Sargassum horneri*	Report from Institute of Rocky Shore Environment and Resources
2	Kishiku	Mizunoura Bay	1,353	34.5	46,679	4.668	*Sargassum piluliferum* *Sargassum horneri* *Undaria pinnatifida* (Wakame)	Report from Institute of Rocky Shore Environment and Resources
3	Sakiyama	Around Sakiyama Port			16,085	1.609	*Sargassum fusiforme*(hijiki)	Measurement by drone photography
4	Kuga	Benten Island	192	10	1,920	0.192		
Total						13.750		

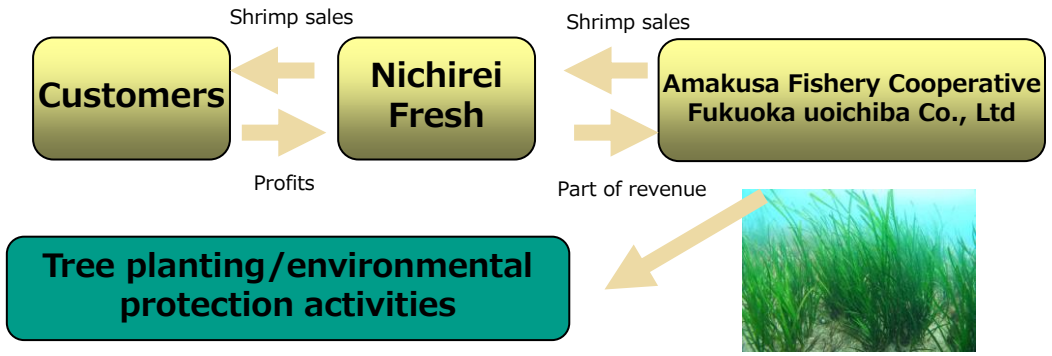
42 Inochi no Umi Project (Nichirei Fresh Inc.)

Kyushu & Okinawa

Establishment and operation of the Eelgrass Fund through seafood processing companies, fishery cooperatives, and fish wholesaler.
Implementation of local eelgrass rehabilitation activities using proceeds from the sale of local fishery resources.

Overview

- Nichirei Fresh Inc., Amakusa Fisheries Cooperative Association, and Fukuoka Uoichiba Co., Ltd jointly established the Eelgrass Fund.
- A portion of the profits will be donated to the fund each year, and the fund will be invested to implement environmental protection and restoration projects
- Contributing to the local community by improving and maintaining the ecosystem of the Ariake Sea through eelgrass regeneration and the purchase of Kumamoto Amakusa shiba shrimp.



Basic Information

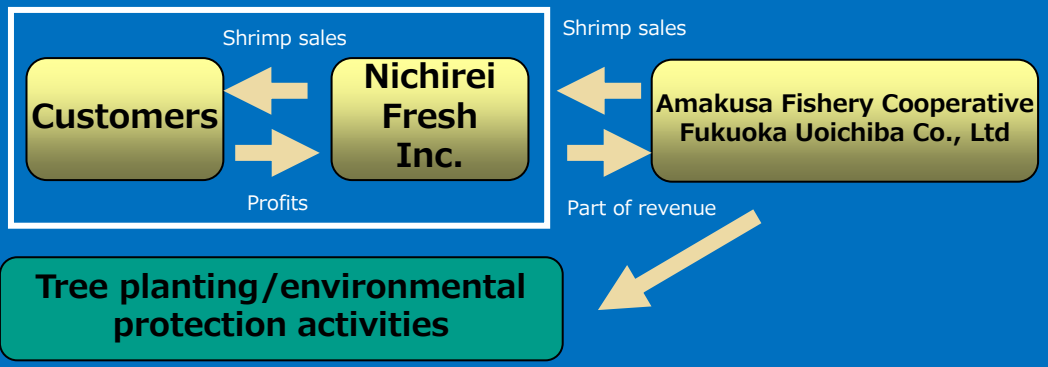
Region	Kamiamakusa City
Participating organizations	Nichirei Fresh Inc.,Amakusa Fishery Cooperative,Fukuoka Uoichiba Co., Ltd
Start year	2022
Contents of activities	• Seeding of seaweeds(Eelgrass) and transplanting of sporophyte • Establishment and management of endowment funds
Site area	–
Amount of CO2 absorption	–

Inochi no Umi Project

★Nichirei Fresh Inc. and other partners established the "Eelgrass Fund" together.
★The partners and our company donate a part of the profits to the fund each year.
★Eelgrass fund is managed and used for environmental protection/restoration projects.

いのちのうみプロジェクト
生命の海プロジェクト

Structure of activities



Consumers can participate in environmental protection activities through the purchase of our products

13 気候変動に具体的な対策を
14 海の豊かさを守ろう
SUSTAINABLE DEVELOPMENT GOALS

We will restore eelgrass beds through the purchase of shrimps from Amakusa, Kumamoto
We will contribute to local communities by improving and maintaining the ecosystem of the Ariake Sea.

Sea of Life Project

Seedling transplantation

Collection of flower limbs

Growing in an aquarium(seawater)

Kami-amakusa, Kumamoto Miyatsu Bay

Sorting and storage of seeds

Transplanting into pots

Expanding the Sea of Life Project

FY2022

Kami-amakusa, Kumamoto
Miyatsu Bay

FY2023

Kami-amakusa, Kumamoto
Miyatsu Bay, Iwa Island

43 Seaweed beds conservation activities in Oita Prefecture (Oita Prefecture)

Kyushu & Okinawa

Exterminating predators such as sea bream and sea urchins.
Conserving seaweed beds by installing sporophyte and visualizing seaweed beds in the coastal areas of the prefecture.

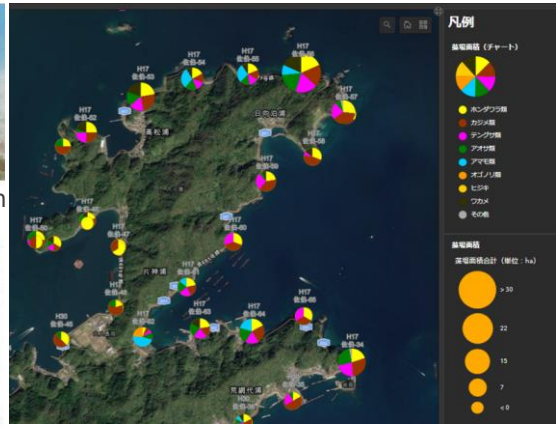
Overview

- As part of the adaptation measures based on the regional climate change adaptation plan, we conserve seaweed beds by removing harmful predators such as sea breams, sea eels, and sea urchins, and installing sporophyte.
- Visualization (GIS data) of the results from surveys on seaweed beds in the coastal areas of the prefecture, and utilization of the data for environmental education, etc.

Bedrock cleaning (Kunimi District)

Seaweed installation (Nagoya District)

Removal of pests (Nagoya District, Saiki Bay District)



Web application

Basic Information

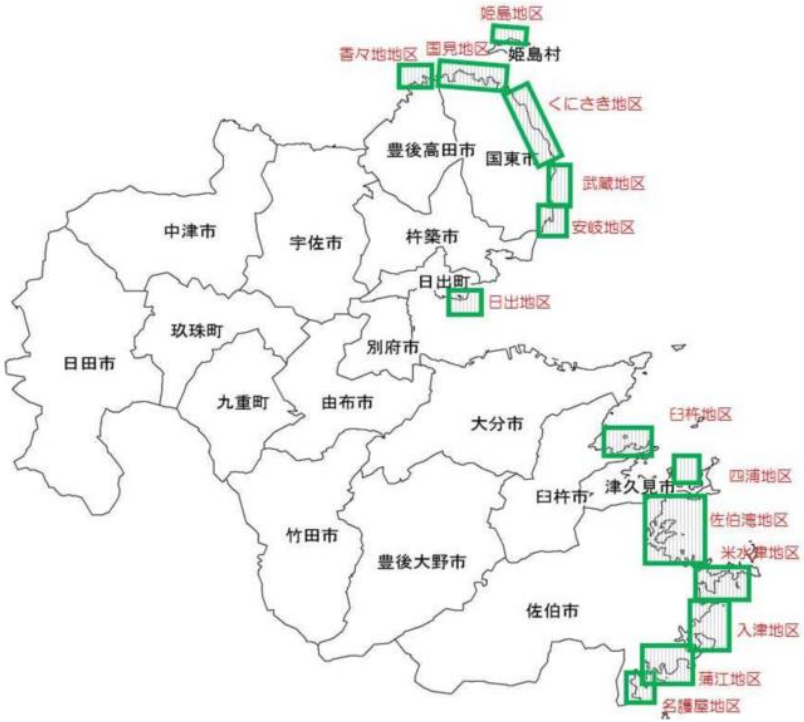
Region	Oita Prefecture
Participating organizations	Oita Prefecture
Start year	–
Contents of activities	• Removal of pests • Seeding of seaweeds and transplanting of sporophyte • Bedrock cleaning Environmental education and public awareness (Visualizing the results from surveys on seaweed beds)
Site area	Approx.1,460ha(Seaweed beds) Approx.3,283ha(Tidal flat) MOE: FY2015-FY2017 Survey of seaweed beds and tidal flats distribution in the Seto Inland Sea, Oita Prefecture
Amount of CO2 absorption	–

The project was funded by the National government.
"Project for Verification of Multifunctional Features" (Fisheries Agency)

Seaweed bed conservation activities

- Adaptation measures based on ‘Regional Climate Change Adaptation Plans’
- Countermeasures for the decrease in seaweed beds, increase in isoyake areas
- Eliminating organisms that cause feeding damages to seaweed beds, such as sea breams, aigo (similar to sea bass), and sea urchins, while conserving seaweed beds by installing sporophyte, which result in (1) supporting aquatic life and providing a place to spawn, protect and nurture immature fish (2) Purify seawater by absorbing nutrients and carbon dioxide and supplying oxygen.

Seaweed bed conservation activities(Oita prefecture)



Bedrock cleaning
(Kunimi District)

Seaweed installation
(Nagoya District)

Removal of pests (Nagoya District, Saiki Bay District)

Removal of sea urchins
(Aki District)

Diadema setosum (Long-spined urchin) extermination
(Yonoudu District)

(Source: Fisheries Promotion Division, Oita Pref.)

44 Blue Carbon Initiatives on Iejima Island (Kokusai Kogyo Co., Ltd.)

Kyushu & Okinawa

Coral conservation efforts through coral habitat improvement, transplantation activities, and feeding damage countermeasures on Iejima Island, Okinawa Prefecture.
Restoration of seaweed beds through sickle grass transplantation verification tests.

Overview

- Coral conservation activities started in collaboration with Iejima Umi-no-Kai, Kokusai Kogyo Co., Ltd.,, Tamagawa Gakuen and Nishimatsu Construction under the coordination of the Fisheries Engineering and Construction Technology Center.
- Coral conservation efforts through coral habitat improvement, transplantation activities, and feeding damage countermeasures, as well as seaweed bed restoration activities through a verification test of transplantation of turtle grass.
- Continuing annual coral propagation activities and holding study sessions for 6th graders on the topic of releasing emperor breams and coral transplantation. Transporting coral collected at Iejima Island to Tamagawa Gakuen, growing and studying coral in an aquarium, transplanting grown coral back to Iejima.

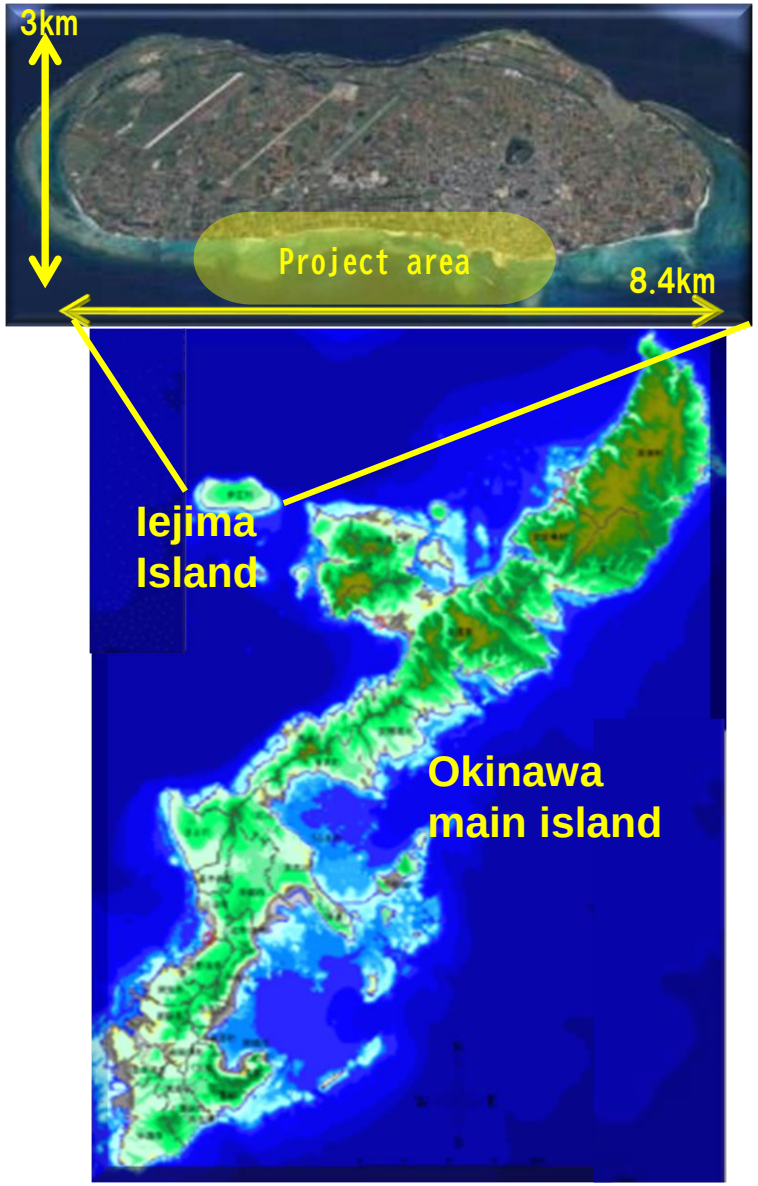
Basic Information

Region	Ie Village
Participating organizations	Iejima Umi-no-Kai (Iejima Fisheries Cooperative) ,Kokusai Kogyo Co., Ltd., Tamagawa Gakuen, Nishimatsu Construction Co., Ltd.
Start year	2009 (Started cooperation:2022)
Contents of activities	• Transplanting seagrass (Collecting and transplanting seaweed seedlings) • Removal of pests(sea urchins) • Basis and vegetation management (rock cleaning) • Beach clean-up • Environmental education and public awareness(elementary, middle and high school students making coral seedlings for transplanting)
Site area	Approx. 35ha (Coral conservation efforts) 4ha (Seaweed bed restoration target)
Amount of CO2 absorption	CO2 absorption target:14.9t-CO2 (transplanting of sporophytes: Approx.800 by 2023)

Previous Initiatives

《Previous Initiatives》

year	Initiatives
H10(1998)	Coral reefs in decline due to large-scale bleaching
H21(2009)	Kokusai Kogyo Co., Ltd. started a verification experiment on a reef in Iejima Island under the Fisheries Agency's "Commissioned Project for Development and Verification of Coral Propagation Technology under Severe Environmental Conditions".
H25(2013)	Kokusai Kogyo Co. succeeds in coral reef development
	Iejima Fisheries Cooperative (Iejima Umi-no-Kai) participates in the "Project for Verification of Multifunctional Features" (Fisheries Agency), focusing on coral propagation using coral propagation reefs.
	Fisheries Civil Engineering and Construction Technology Center and Kokusai Kogyo Co. joined in, providing technological support.
	Since, the coral propagation activities have continued every year, and study sessions on emperor breams release and coral transplantation have been held for sixth-graders in Iejima Island.
R3(2021)	Iejima Umi-no-Kai, Kokusai Kogyo Co., Ltd., Tamagawa Gakuen and Nishimatsu Construction Co., Ltd. started coral conservation activities under the “Verification of Multifunctionality" project coordinated by the Fisheries Engineering, Civil Engineering and Construction Technology Center.
	In addition to coral conservation, the Iejima Sea Association and Kokusai Kogyo Co. have begun efforts to restore seaweed beds.
R5(2023)	Ongoing efforts to conserve coral and restore seaweed beds through industry-academia collaboration with the Iejima Sea Association



Coral Conservation Efforts

Removal of pests

crown-of-thorn starfish

Coral conservation efforts through coral habitat improvement

Removing sediments (bedrock cleaning)

Removing seafloor waste (seafloor cleaning)

Coral transplant activities

Collection of juvenile corals

Coral breeding reefs (Fisheries Agency project)

Collecting coral for transplanting

Fragmentating coral for transplanting

Making and transplanting coral seedlings

- Elementary school students making coral seedlings for transplanting -

Measures to prevent food damage

- Transplantating to conservation areas -

Coral Conservation Efforts

Transporting coral collected at Iejima Island to Tamagawa Gakuen
⇒ Growing and studying coral at Tamagawa Gakuen ⇒ Transplanting grown coral back to Iejima

Collecting and transporting of juvenile corals

Collecting juvenile corals

Transport to Tamagawa Gakuen

Coral breeding and research

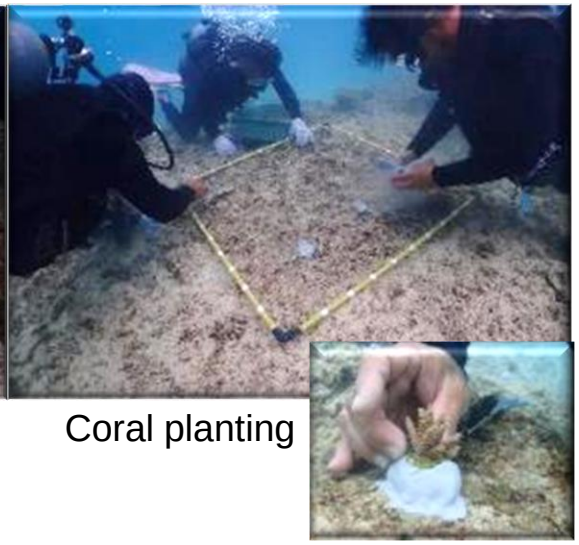
Cultivation at Tamagawa Gakuen

Transporting transplanted coral

Transportation of transplanted coral from Tamagawa Gakuen to Iejima Island

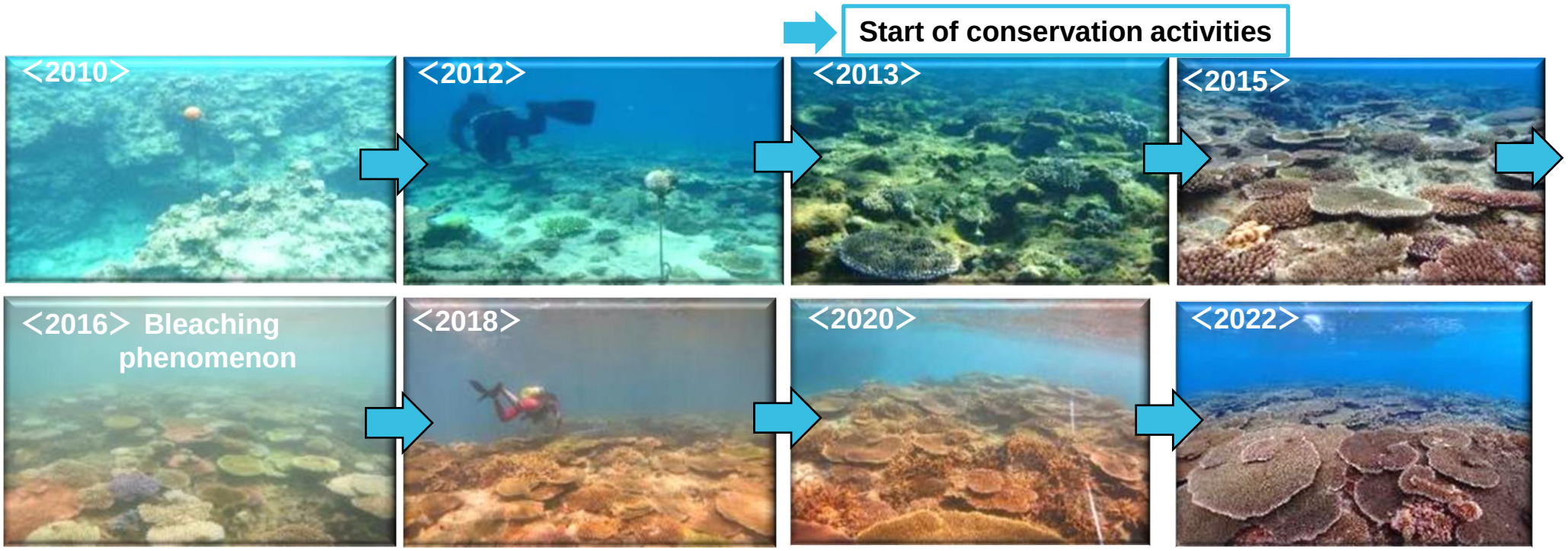
Coral habitat improvement and planting

Rock cleanup of planting sites



Coral planting

The Changes in Coral Reefs around Iejima Island



Since 2013, the coral reefs have gradually increased due to various activities conducted in the waters surrounding Iejima Island, such as rock cleaning.

During the activity period, coral bleaching was observed in 2016, resulting in a temporary decrease in the number of corals, but the corals began to increase again, due to continuous conservation activities.

In recognition of these coral conservation activities, the "Iejima Sea Association" was awarded the Chairman's Award at the 37th National Convention for the Conservation of the Sea (held in October 2017)

Seagrass Bed Conservation Activities

Changes in Seagrass beds (Iejima Island)

Seagrass bed conservation

Sickle seagrass, which thrived widely in the past, disappeared around 2018.

Collecting and transplanting seaweed seedlings in the sea area near Iejima Island

Collecting seedlings

Transplantation verification experiments

(Indoor tank)

(Field test)

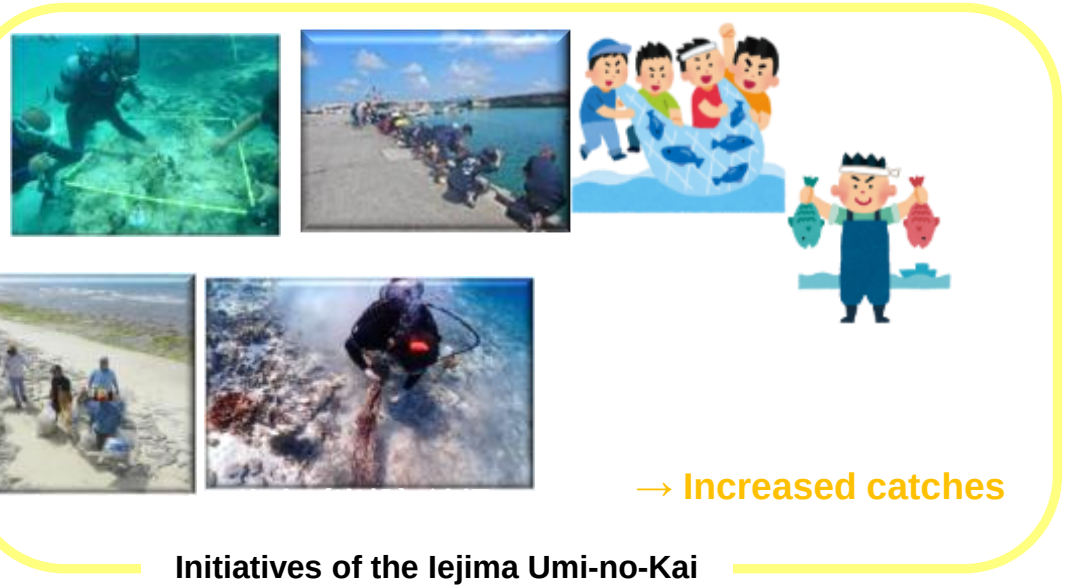
Transplantation verification experiments are underway in the indoor sea area, with seeds and seedlings purchased from the main island of Okinawa, while taking DNA into consideration.

Benefits of Collaboration Among Diverse Entities

Decline of coral and seaweed beds
Decline in fish and shellfish

Causes of coral decline
- Bleaching due to high water temperature
- Feeding damage by crown-of-thorn starfish
- Loss due to typhoons, etc.

Causes of seaweed decline
- Destabilization of seabed sand
- Effects of predators
- Lack of seedlings, etc.



→ **Increased catches**

Initiatives of the Iejima Umi-no-Kai

Tamagawa Gakuen, Nishimatsu Construction

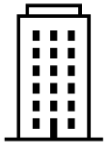
Aiming for recovery of coral reefs

Restoration of seaweed beds

Tourism and Fisheries Local revitalization School trips (overnight stay)

KOKUSAI KOGYOU Co., Ltd.
国際航業

Sharing molding technology, corporate responsibility (CSR,ESG,SDGs)



Expected effects of collaboration with diverse entities
(1) Sharing awareness of issues
(2) Strengthening the organization of activities
(3) Activation, diversification, and efficiency of activities
(4) Understanding and participation in activities spreading throughout the community
(5) Contribution to fishing villages and regions

Future coral and seaweed bed conservation activities

○Aiming for more reliable coral transplantation and the regeneration and restoration of seagrasses that play an important role in coral reef areas
○To realize effective conservation and rehabilitation activities by strengthening the structure of activity organizations and revitalizing their activities

45 Mangrove Planting Activities at Nagura Bay, Ishigaki Island, Okinawa, Japan, by Yaeyama Lions Club (Yaeyama Lions Club)

Kyushu & Okinawa

Mangrove planting activities in collaboration with organizations/companies, and other Lions Clubs throughout Japan.

Overview

- The Yaeyama Lions Club has been planting mangroves along the coast of Nagura Bay, Ishigaki Island, to restore mangrove ecosystems including the number of living creatures in the mudflats that have been affected by coastal infrastructure development.
- The Club plants 2,000 Yayama-hirugi seedlings every year, together with seven organizations and companies from different parts of Japan that support the planting of mangroves. Club members collect seeds from the planted Yaeyama- hirugi and raise them at their own home nurseries for two to three years before transplanting them back to Nagura Bay.
- The Club also strives to raise awareness on the importance of mangrove ecosystems among local residents by holding symposiums on the natural environment of Ishigaki Island, such as "Thinking about Mangrove Planting" and other events.

Basic Information

Region	Ishigaki City (Ishigaki Island)
Participating organizations	Yaeyama Lions Club, Okazaki Minami Lions Club, NPO Green Japan, BRONCO BILLY Co. Ltd., Sapporo Snowtopia Lions Club, Tokyo Hachioji Icho Lions Club, Osaka Sakuranomiya Lions Club
Year started	1990
Activities	• Planting mangroves • Holding symposia of environmental for public awareness
Site area	–
Amount of CO2 absorption	–

Planting mangroves –1– collect seeds and raise them in a nursery

Jun.-Jul. Collect seeds of *Rhizophora stylosa* (*Yaeyama-hirugi* in Japanese)

Plant them in a nursery.
Raise them for 2 to 3 years.

Preparing to transplant the seedlings.

Seedlings brought to the planting site of Nagura Bay.

Planting mangroves -2- transplant the seedlings

Bamboo sticks are attached to the seedlings to prevent them from washed away by strong waves

Mangrove planting area

A couple of seedlings are planted together as “Group Planting Method” to get higher survival rate

A couple of seedlings are planted together as “Group Planting Method” to get higher survival rate

Mangrove Planting Symposium

May 14, 2023
The Yaeyama Lions Club organized a symposium "Thinking about Mangrove Planting" in Ishigaki Island to discuss the importance of Island’s natural environment.
Prof. Shigeyuki Baba, Executive Director of the International Society for Mangrove Ecosystems, gave a lecture on the importance of the mangrove ecosystem and its roles, and he proposed an initiative for tourists to purchase and plant mangrove seedlings from a "carbon neutral" perspective that would reduce greenhouse gas emissions.

Before the symposium, the Club conducted a questionnaire survey targeting residents of the Nagura Bay area, and 74% of the residents responded in favor of the club’s tree-planting activities.