Case Study on
Blue Carbon Initiatives in Japan

Conserving and Restoring Coastal Ecosystems as a Solution to Climate Change

December 2023

Blue Carbon Liaison Council
(Ministry of the Environment)

Blue Carbon Initiatives in Japan

Blue carbon project sites

Area	Number of Project sites
Hokkaido and Tohoku	10
Kanto	8
Chubu and Hokuriku	6
Kansai	6
Chugoku and Shikoku	11
Kyushu and Okinawa	16
Total	57 (45 initiatives)

Introduction

1. Blue Carbon Ecosystem with Diverse Values

The use of ‘blue carbon’: carbon stored in marine organisms such as seaweed and seagrasses, is attracting worldwide attention as a new option for absorbing and fixing atmospheric carbon dioxide, which causes global warming. Marine organisms that accumulate blue carbon not only absorb and fix atmospheric carbon dioxide, but also bring various added values to environmental conservation, which include the improvement of water quality, preservation of ecosystems, and serving as a platform for community-wide environmental education. They are also essential marine ecosystems with multifaceted values, such as maintaining and improving fishing environments through seaweed bed creation. In Japan, we are actively pursuing initiatives related to blue carbon, aligning with the goal of achieving net-zero emissions by 2050, promoting resource circulation (circular economy), and comprehensively advancing nature restoration (nature-positive) to enhance environmental, economic, and social integration.

2. Anticipations for Blue Carbon as a Solution to Climate Change

As an island nation surrounded by ocean, Japan has been working on the creation of seaweed beds and related efforts, primarily involving fishermen, local authorities, and businesses, to combat the significant reduction and disappearance of seaweed beds due to ‘isoyake’ (seaweed deforestation). In the context of achieving the 2050 net-zero goal, initiatives related to blue carbon have gained importance as measures for carbon dioxide absorption sources, and the government is further strengthening its efforts, taking a unified approach to promote initiatives related to the use of blue carbon ecosystems.

In January 2023, the Ministry of the Environment, the Ministry of Agriculture, Forestry and Fisheries, the Fisheries Agency, and the Ministry of Land, Infrastructure, Transport and Tourism joined forces to establish a new ‘Blue Carbon Liaison Council’ to promote government-wide efforts to utilize blue carbon ecosystems. In April 2023, Japan became the first country to report the amount of carbon absorbed by mangrove forests, one of the blue carbon ecosystems, in FY2021 to the Secretariat of the United Nations Framework Convention on Climate Change.

Introduction

3. Progress in Efforts Involving Businesses, Civic Organizations, etc.

In addition to cooperation among relevant ministries and agencies, efforts involving businesses, civic organizations, and others have become more active. For example, the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) has categorized seaweed beds, tidal flats, and port and harbor structures that coexist with organisms (port and harbor structures that have the basic functions of port and harbor structures while also functioning as habitats for organisms) as ‘blue infrastructure.’ The MLIT is carrying out projects to promote participation from businesses and civic organizations through activities such as matchmaking support and awareness campaigns, aiming to expand the preservation, regeneration, and creation of Blue Infrastructure.

The issuance of ‘J Blue Credit’ began in FY2020, targeting the conservation and development of blue carbon ecosystems. This enables credits based on the carbon dioxide absorption resulting from seaweed bed conservation activities to be transacted between those implementing preservation activities and companies or organizations working on carbon dioxide reduction.

In recent years, the use of the latest digital technology, such as drones in environmental surveys of seaweed and underwater monitoring, which contribute to more efficient calculation of blue carbon, has also progressed, further expanding the circle of initiatives related to blue carbon.

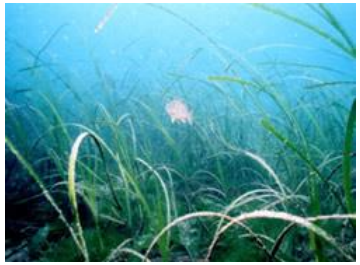
Based on these latest trends, this publication introduces case studies of activities related to the promotion of blue carbon in Japan by companies, local governments, and others. We hope that this publication will help provide a concrete image of the initiatives for the promotion of blue carbon and, hence, be of use to those who are considering such initiatives in the future.

What is Blue Carbon?

Marine plants **absorb CO2 dissolved in seawater through photosynthesis.**
They then **sequester carbon through the food chain and by depositing it on the seafloor after they die.**
Such plants are called **‘blue carbon ecosystems.’**
In Japan, blue carbon ecosystems include **(1) seagrass beds (eelgrass, etc.), (2) seaweed beds (wakame seaweed, kelp, etc.), (3) wetlands and tidal flats, and (4) mangrove forests**, each with a different carbon sequestration mechanism.

1. Seagrass beds

・Seagrasses and the microscopic algae attached to their leaves absorb CO2 and grow through photosynthesis.
・The seafloor in seagrass beds is a large carbon reservoir for ‘blue carbon’.
・In a survey of the seafloor of the Seto Inland Sea, eelgrass-derived carbon was found in layers as old as 3,000 years.



2. Seaweed beds

・When seaweed is torn off, it becomes ‘drift weed’ drifting on the surface of the sea.
・Seaweeds that do not take nutrients from their roots do not die immediately after being torn off, and some of them end their lives and sink and are deposited on the deep-sea floor.
・The carbon derived from seaweed stored at the bottom of the deep sea is also called ‘blue carbon.’

3. Wetlands and tidal flats

・In wetlands and tidal flats, reeds and other plants thrive and absorb CO2 through photosynthesis.
・Based on microscopic algae in seawater and on the surface of the earth, a variety of living organisms linked through the food chain inhabit the seafloor, where their remains accumulate, storing carbon as ‘blue carbon.’

4. Mangrove forests

・Mangrove forests store carbon in the trees as they grow, and their dead branches and roots accumulate in the mud on the sea floor, storing carbon.
・In Japan, mangrove forests are distributed along the coast of Kagoshima and Okinawa Prefectures.

Fisheries Agency pf Japan Website：https://www.jfa.maff.go.jp/j/kikaku/tamenteki/kaisetu/moba/moba_genjou/syurui.html
UNEP(United Nations Environment Programme）：https://www.grida.no/publications/145

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01 Fertilization Project in Suttsu Town, Hokkaido Prefecture (Suttsu Town)

Hokkaido & Tohoku

Restoration of seaweed beds by introducing degradable compost blocks made from waste (fishery wastes, wood chips, sewage sludge) into the sea.

Overview

- In order to prevent isoyake and the progressive loss of seaweed beds due to lack of nutrients, degradable compost blocks produced from fishery waste, wood chips (unused materials), and sewage sludge are put into the sea.
- The project is led by the Suttsu Fishery Cooperative Association, in cooperation with the Suttsu Fisheries Processing Cooperative Association (compost production) and the Association for Enrichment of the Sea of Suttsu Town (fertilizer application to the sea area).

Basic Information

Region	Suttsu Town
Participating organizations	Association for the Enrichment of the Sea of Suttsu Town Suttsu Fishery Cooperative Association, Suttsu Fisheries Processing Cooperative Association, Suttsu Town
Start year	2007
Contents of activities	• Improvement of water bottom quality (production of compost utilizing waste, processing into degradable blocks and putting into the sea area) *The project was funded by the National, Provincial, and Township governments. The fertilizer production facility was funded by the H23 Regional Revitalization Grant.
Site area	22ha
Amount of CO2 absorption	–

In-house-built compost production facility / Compost (fertilizer) production

In-house-built compost production facility

Compost (fertilizer) production （raw materials)

Salmon/trout hatchery detritus, sea urchin shell residue, fish solubles

Woodchips (from unused wood)

Fish soluble

Sewage sludge

Composting

Compost for 3-6 months

Aerate 3-4 times a month

Processing into compost degradable blocks

Press machine for manufacturing the fertilizer
(Made by Kotobuki Sangyo Corporation)

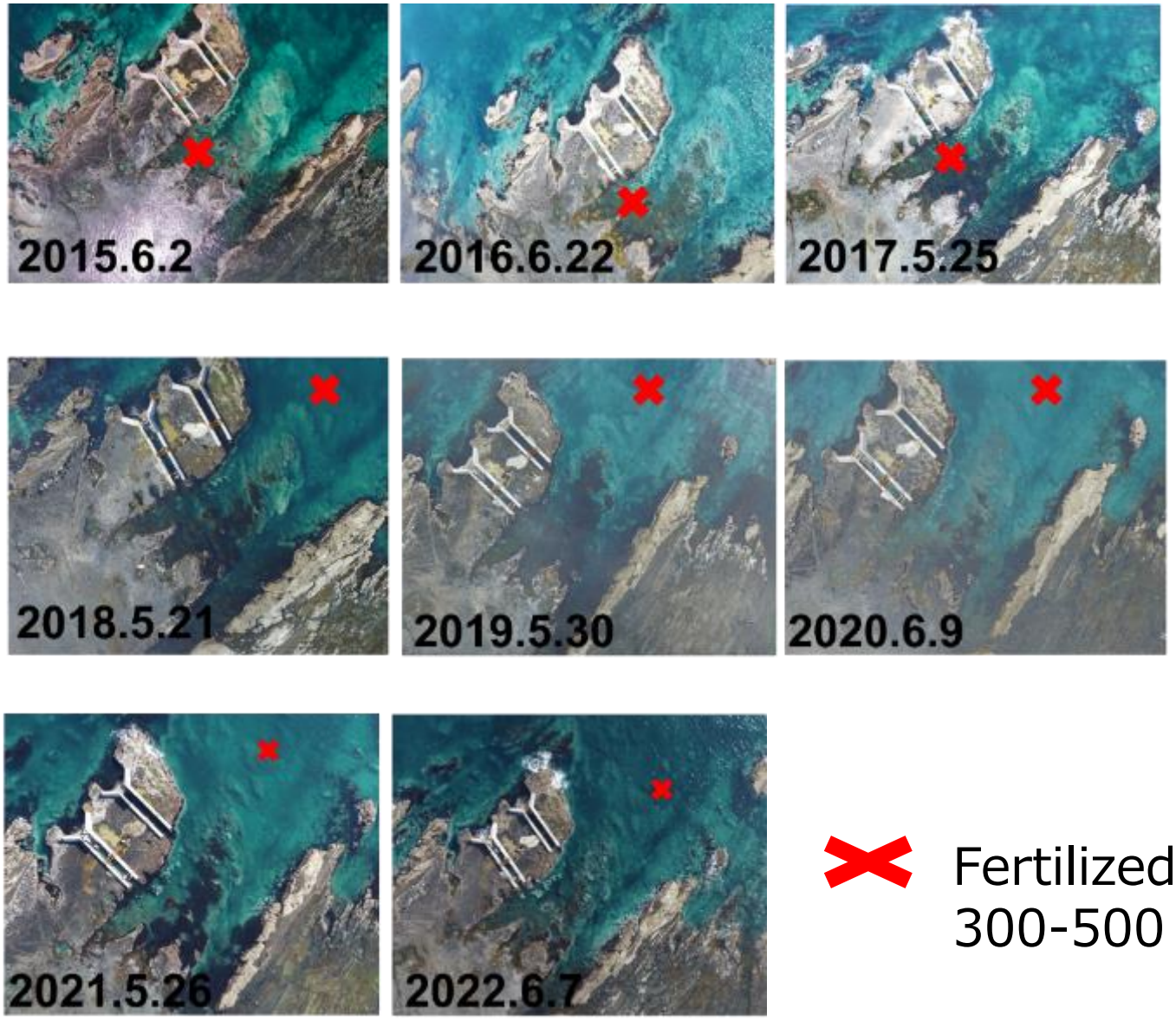
compression force of 20 tonf

Degradable compost blocks
Cylinder : φ260mm, H230mm
Weight : 16kg

Throwing compost degradable blocks into the sea

Effect evaluation using aerial photographs

Effect evaluation using aerial photographs



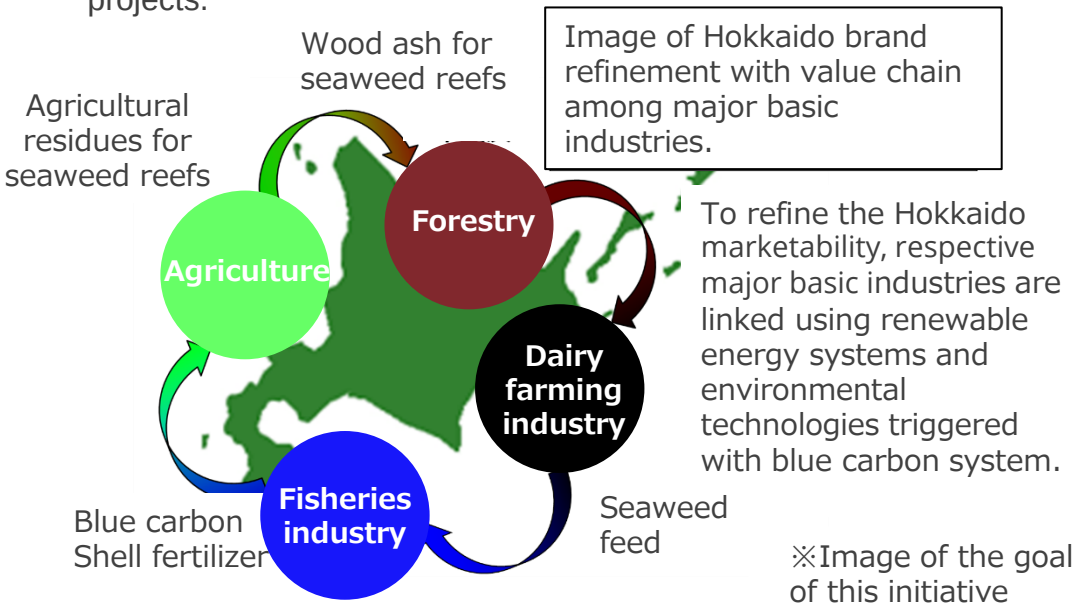
02 Investigation of CO2 Absorption and Sequestration by Blue Carbon Ecosystems in Coastal Areas of Hokkaido (Hokkaido Electric Power Co., Inc.)

Hokkaido & Tohoku

Research development for blue carbon projects in coastal areas of Hokkaido.
Alliance building for Promotion of Zero Carbon Hokkaido at Hokkaido's ports and harbors.

Overview

- A joint research and development agreement was signed with the Hokkaido Research Organization in April 2023. To popularize the blue carbon project throughout Hokkaido's coast, technologies such as seaweed reef blocks and aquaculture technologies adapted to respective environmental conditions of sea areas are being developed.
- A collaboration agreement was signed with the Hokkaido Regional Development Bureau in April 2023. To realize "Zero Carbon Hokkaido", an alliance was built for a carbon-neutral system of Hokkaido's ports and harbors including blue carbon projects.

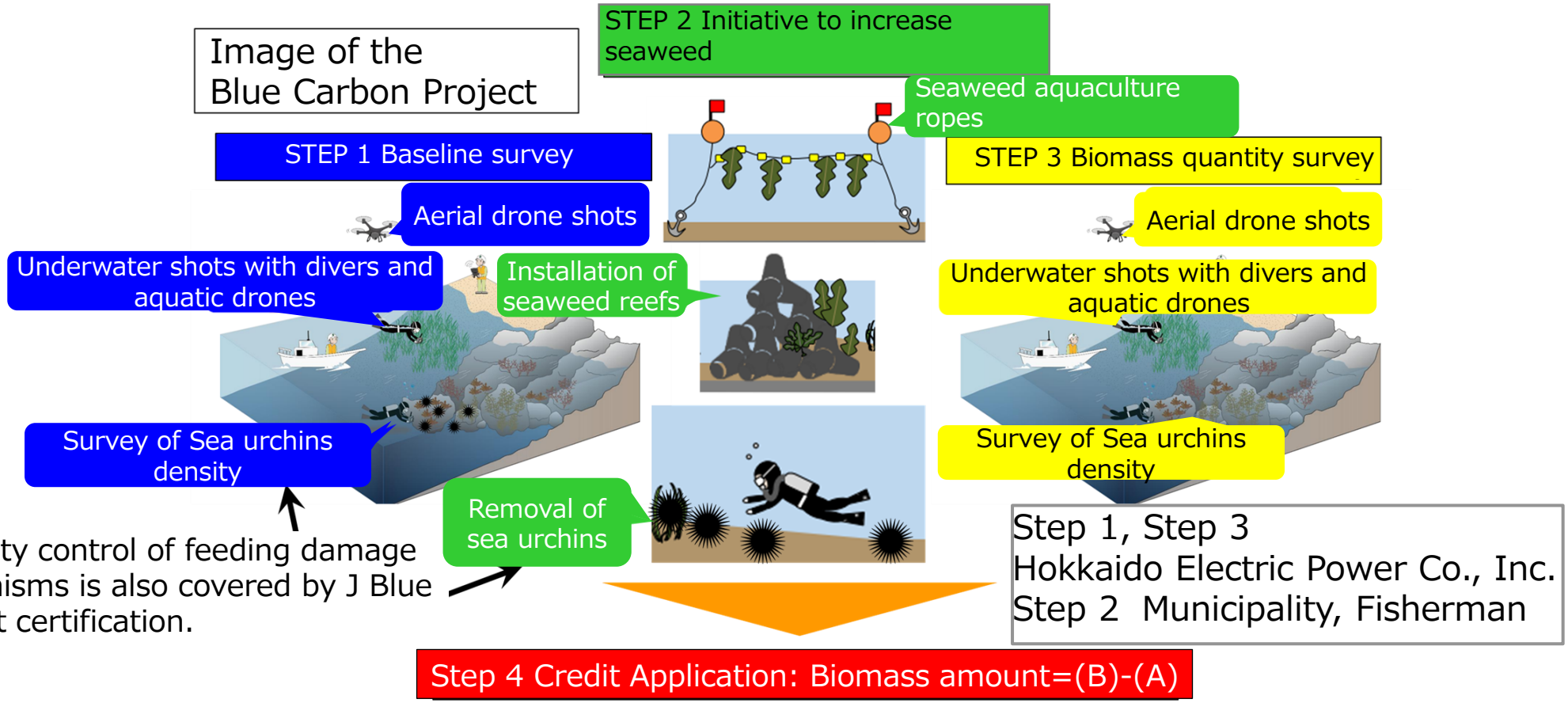


※Image of the goal of this initiative

Basic Information

Region	Hokkaido Prefecture
Participating organizations	Hokkaido Electric Power Co., Inc. (consisting of the Hokkaido Research Organization, and the Hokkaido Regional Development Bureau)
Start year	–
Contents of activities	• Production of Seaweed reef/fertilizer blocks • Technology development (seaweed reefs / fertilization blocks, drone surveys, onshore seaweed cultivation)
Site area	–
Amount of CO2 absorption	–

Overall picture of the project



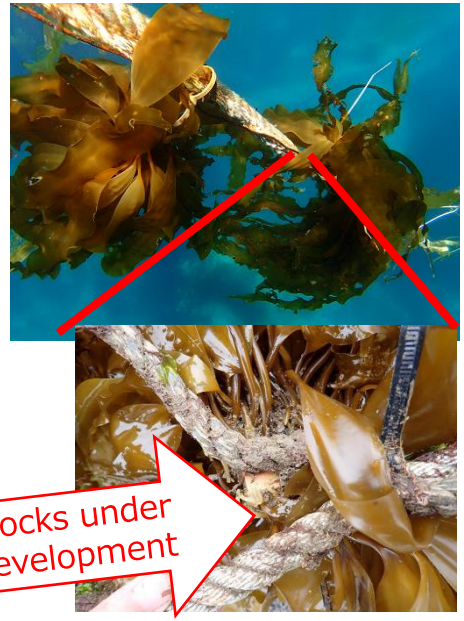
Step 2 Implementation of seaweed propagation measures (technology development)

Business entity	Location	Initiative
National, Hokkaido Prefecture, Hokkaido Regional Development Bureau (Public Works)	Port and harbor	Port and harbor structures (seaweed reef blocks)
Fisherman	Fishing grounds	Fertilizer block
		Sea urchin capture
	Land	Land-based cultivation of seaweed

Actions for Projects (1)

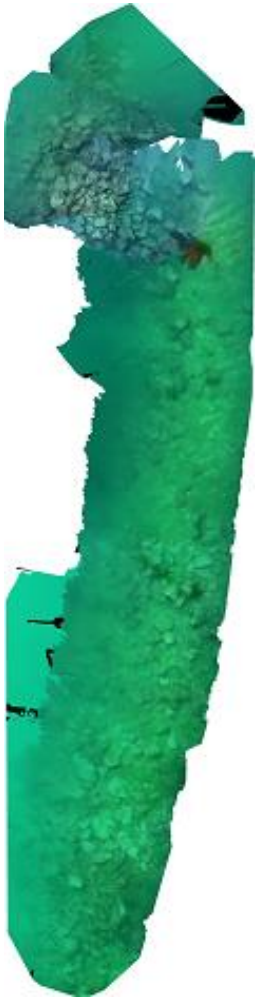
Progresses in each actual sea:

①Artificial Reef block testing



Reef blocks compounding test

②Drone testing

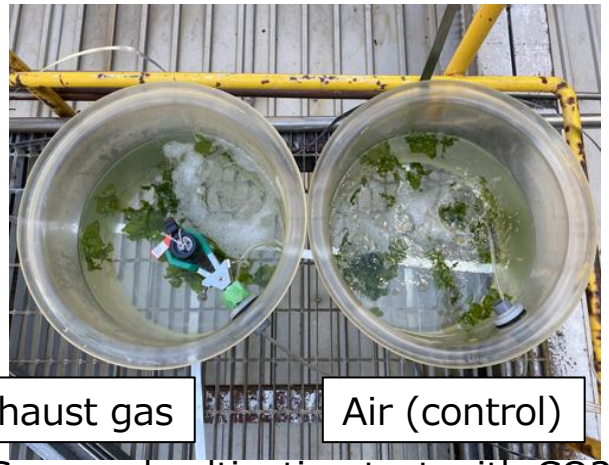


Sea-bottom orthoimage generated from underwater drone shots

Orthoimage generated from aerial drone shots

Aquatic drones under development

③Onshore seaweed cultivation testing



Seaweed cultivation test with CO2 from exhaust gas or DAC system

Seaweed	Amount of CO2 absorption(kg/year)
 Sewing thread	870
 Sea lettuce	270

Amount of absorbed/stored CO2 by Land-based cultivation of seaweed (Calculation results based on a 200m3 tank capable of producing 1tonne of dried laver per year.)

Actions for Projects (2)

Determination of production process using 50 mm cube block

Shells (before crushing)

Shells (after crushing)

Biomass ash

Concrete sludge

Mix, Add water, Knead, Cast

【Concept】

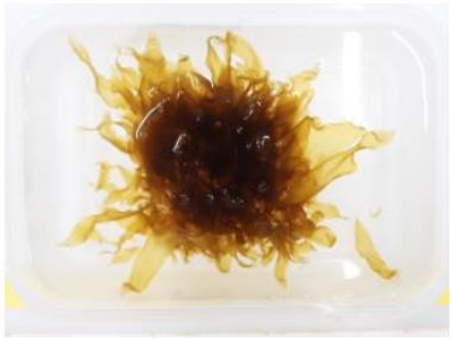
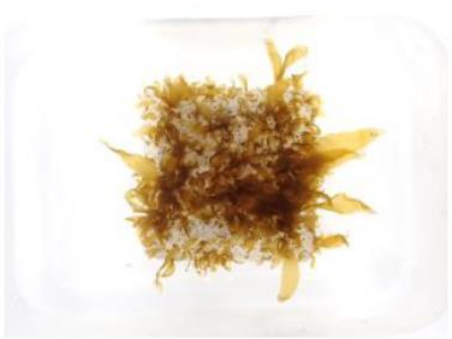
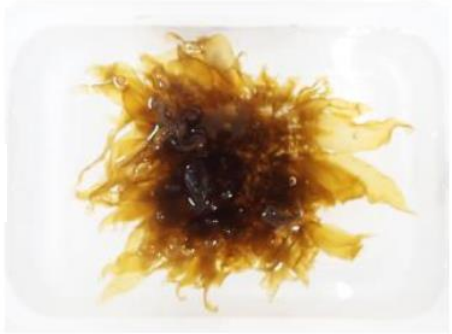
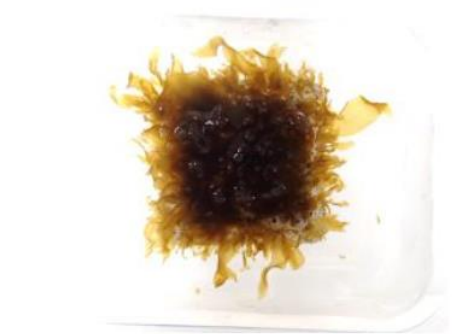
- ✓ Utilization of fertilizer (shells)
- ✓ Utilization of wood ash
- ✓ Utilization of concrete sludge
- ✓ Application for both reef and fertilizer

→Revitalization of other industries

Cure and Demold

Actions for Projects (3)

Screening test of optimized composition for fertilization reef using 50 mm cube blocks of (Kelp (Rishiri Kombu), laboratory culture)

	Case 1	Case 2	Case 3	Case 4
1st				
2nd				

*Noticeable differences in the initial growth of Kelp due to fertilization levels.

Actions for Projects (4)

Technology development image for the enrichment of fishery resources using offshore wind farm

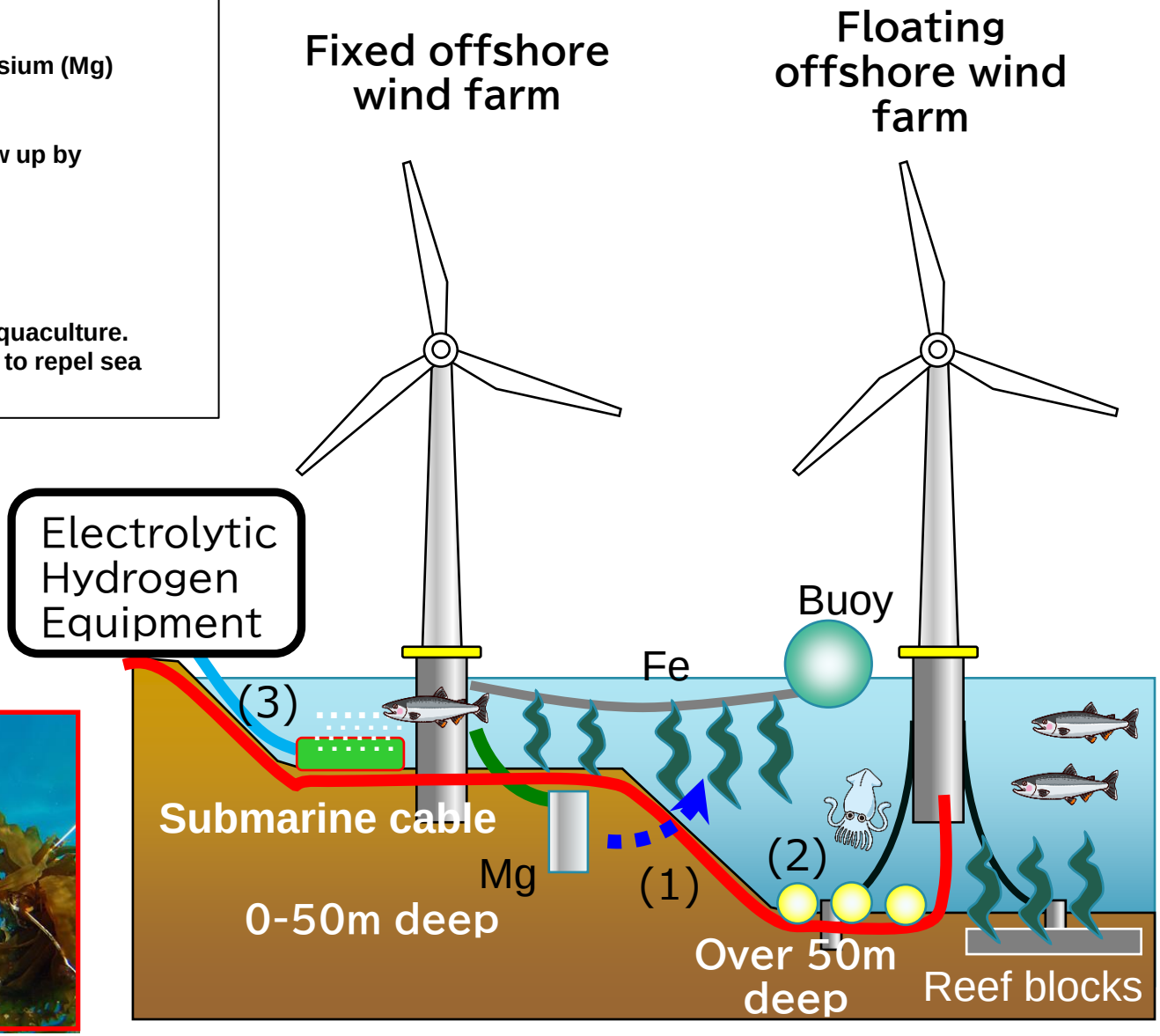
[Keywords]
seaweed bed creation, blue carbon, spawning grounds

(1) Technology to promote seaweed growth by using magnesium (Mg) electrodes for corrosion protection.

(2) Technology for deep sea seaweed bed. Seaweed can grow up by submarine cable-powered LED (partly as a fish attractor).

(3) Aquaculture technology by oxygen from electrolysis.
(Plankton, fish and shellfish in addition to seaweed?)

→ Microbubble technology is also available for land-based aquaculture.
(Side note) Electrolyzed hypochlorous acid can also be used to repel sea urchins.



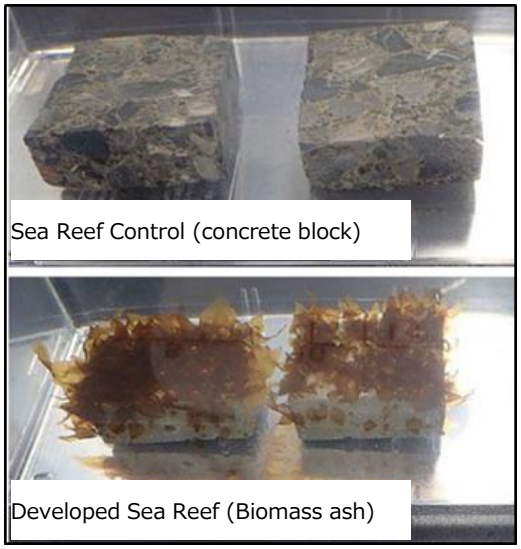
Collaboration agreement signed with the Hokkaido Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism (Strengthening of cooperation such as information exchange and joint research on zero-carbon Hokkaido initiatives utilizing ports and harbors)

◆ Study of carbon dioxide absorption and sequestration to blue carbon ecosystems in ports and harbors

Carbon absorption of the marine ecosystem by photosynthesis, etc. is called "blue carbon“. It is a new option as a CO2 storage resource. Therefore, we are developing seaweed aquaculture technologies in ports and harbors, and estimate a beneficial amount of CO2 absorption by blue carbon.

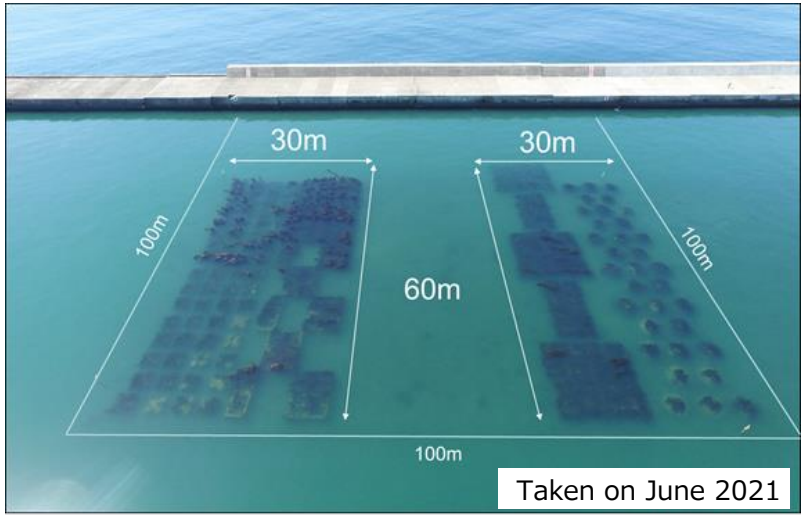
Past Projects and Future Directions

- Hokkaido Electric Power Company (HEPCO) has begun experiments to create seaweed beds with low-carbon seaweed reef materials using combustion ash generated by woody biomass power plants, etc. in the Tomakomai Port East Area, where the Tomatou Atsuma Power Plant is located, as a test field.
- The Hokkaido Development Bureau has experience in technological development for creating seaweed beds in ports and calculating the amount of CO2 absorbed by blue carbon. The two parties will promote efficient and effective studies through their experience and knowledge.



[Left] Development of Low-Carbon Sea Reef Materials
HEPCO has developed a technology for seaweed reef plates that utilize combustion ash and coal ash from power plants (e.g. woody biomass plants) and other facilities, reducing CO2 emissions during manufacture compared to conventional concrete.

[Right] Creation of seaweed beds on breakwaters and calculation of CO2 **absorption**
The Hokkaido Regional Development Bureau has developed technology to create seaweed beds using dredged sediment at Kushiro Port. They have estimated that the amount of CO2 absorbed per unit area by blue carbon is 2.4 times that of a forest.



Creation of seaweed beds on the embankment behind the island breakwater in the western port area of Kushiro Port

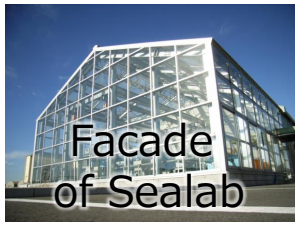
03 “Marine Forestation" activities through seaweed bed creation and restoration(Nippon Steel Corporation)

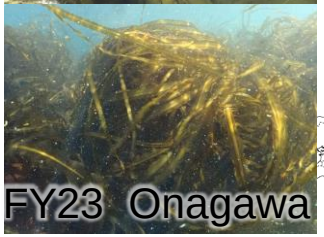
Hokkaido & Tohoku

Research on the main causes of the decline in seaweed beds and verification tests in the actual sea.

Overview

- Narrowing down the factors of seaweed bed decline and formulating hypotheses through interviews with fishermen, seawater surveys, etc.
- Verifying the hypothesis of seaweed bed decline through laboratory experiments and actual sea trials and developing solutions according to the sea area conditions.
- Accumulating results of seaweed growth in the actual sea, going back to laboratory verification, considering further conditions to promote seaweed growth, making improvements, expanding application areas, and improving the accuracy of the technology.





Basic Information

Region	Mashike Town, Tomari Village, FurubiraTown, Shikabe Village, Onagawa Town, Shima City
Participating organizations	Nippon Steel Corporation,Mashike Fishery Cooperative Association、Furuu District Fishery Cooperative Association, Higashi Shakotan Fisheries Cooperative Association, Shikabe Fishery Cooperative Association, Miyagi Prefecture Fishery Cooperative Association(Onagawa Branch), Miegaiwan Fisheries Cooperative Association, Funakoshi Fishing Rights Management Committee
Start year	2004
Contents of activities	• Technology development (verification of seaweed bed decline mechanism and development of seaweed bed restoration technology) • Improvement of water bottom quality (burial and sinking of fertilizer materials supplying Fe ions) • Installation of rock/block substrate (installation of seaweed bedding material)
Site area	–
Amount of CO2 absorption	–

“Marine Forestation" activities through seaweed bed creation and restoration
- Research on the main causes of seaweed bed decline and verification tests in the actual sea -

1. Overview of Projects

(1) Investigating factors that cause decline in seaweed beds in the actual sea

[Aim]
Narrowing down the causes and formulating hypotheses through research interviews with fishermen, seawater surveys, etc.

Factor 1: Environmental change
・Nutrient deficiency (N, P, Fe)
・Rise in seawater temperature
・Change in flow field due to offshore construction (inflow of sand, calming)
Factor 2: Characteristics of the sea
・Feeding damage
・Increase in feeding of herbivores


Seaweed dying due to high water temperatures


Seaweed preyed on by fish

(2) Verifying the seaweed bed decline mechanism
・Developing seaweed bed restoration technology
[Aim]
・Verifying the hypotheses of seaweed bed decline through laboratory experiments and trials in the actual sea
・Developing solutions for better sea conditions.

[Research Contents]
・Clarifying the nutrient leaching and diffusion phenomena
・Establishing construction conditions suitable for the promotion of algal blooms
・Developing a model for predicting the effects of seaweed bed creation

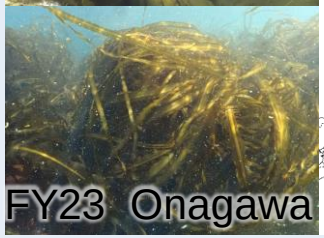

Facade of Sealab


Simulated coastal environment

(3) Verification test in the actual sea

[Aim]
・Accumulating actual algal blooms in the actual sea
・Returning to the laboratory for and further pursue and improving conditions that promote algae growth
・Improving technology through expansion of project areas


FY23 Furubira


FY23 Onagawa

FY2010: 6 sea areas
FY 2011: Expansion throughout the country

2. Project and Results (Remarkable points)

＊ **Photo source: Fisheries Agency, "Guidelines for Isoyake Countermeasures"**

Research and Development: Systematic efforts are being made to conduct causal investigations, laboratory research, and field verifications in the actual sea in a linked manner.
Regional issues: The team is persistently seeking the understanding of local governments and fishery cooperatives and is addressing issues in cooperation with related parties.

(1) Estimated Cause of the Seaweed Bed Decline due to the *Isoyake*, Sea Desertification

● **Listing the causes of the decline in seaweed beds with reference to the Fisheries Agency's "Guidelines for *Isoyake* Countermeasures" and "Vision for Seaweed beds and Tidal Flats."**

Primary cause (Changes in the environment)

・Nutritional ingredients deficiency (N, P, Fe)
・Rise in seawater temperature
・Change in flow field due to offshore construction (sand inflow, calming)
・Typhoons, increased precipitation

↑ Seaweeds dying due to high water temperature

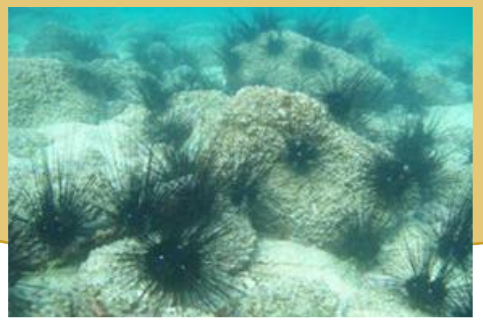
Secondary cause (Changes in the sea)

・Physiological disorders of seaweeds
・Feeding damage (Increase in feeding of herbivores)
・Competition with small seaweeds
・Inhibition of seaweed growth
・Increase in turbidity

↑ Seaweed preyed on by fish

Direct causes

・Withering and dying
・Stoppage of growth
・Outflow
・Consumption by plant-eating animals



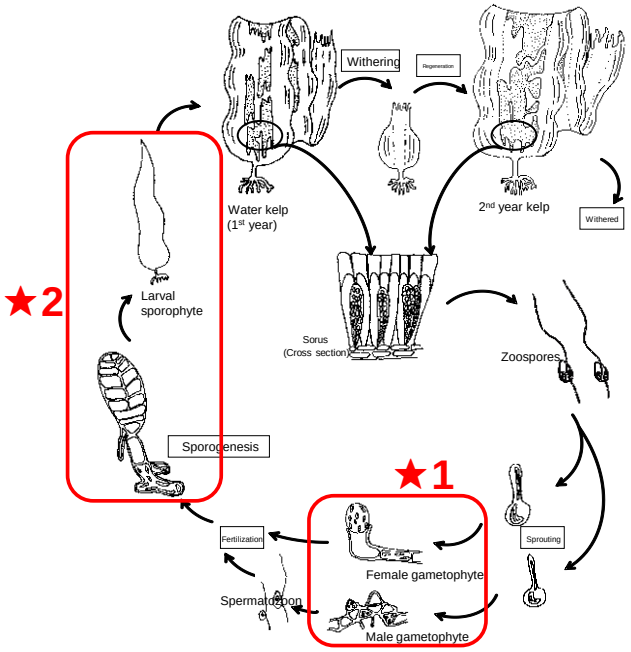
↑ Seaweed beds declined and taken over by sea urchins

∗ Sources: Guidelines for Isoyake Countermeasures and Vision of Seaweed Beds and Tidal Flats, Fisheries Agency

Primary and secondary factors combine in each marine area, resulting in multiple direct causes of algal bed decline.
➔ It is important to take measures matched to the factors and causes at the site.

(2) Research on Technology to Combat Seaweed Bed Decline - Fe ions Deficiency -

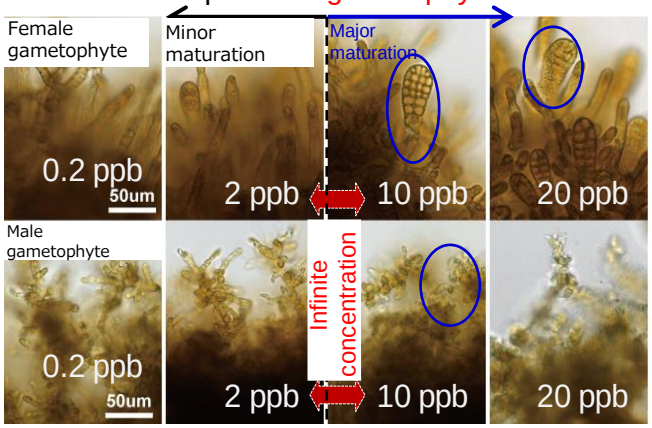
- **Fe ions necessary for the life cycle of seaweeds**



Life Cycle of Saccharinales Plants

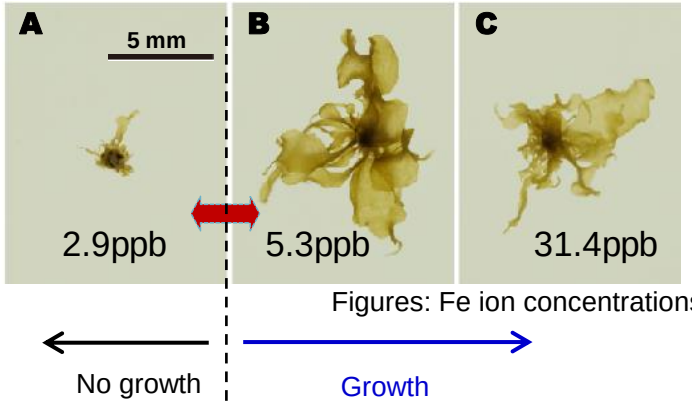
- **Experimental addition of Fe ions to kelp**
  (Ueki et al., Nippon Steel Technical Report No. 391, 2011)

★1 Fe ions are required for gametophyte maturation



Figures: Fe ion concentrations

★2 Fe ions are required for sporophyte growth



Figures: Fe ion concentrations

The presence of Fe ions is essential for the life cycle growth process of sweet kelp.

Promotes seaweed bed regeneration by artificially generating and supplying iron humate (Fe ions), which is essential for seaweed growth

(2) Research on Fertilization Technology for Seaweed Bed Restoration

● Development of Fe ion-supplying fertilizer (Vivary™ Unit)

[Aim] To reproduce Fe ion supply from soil (from mountainous area) with steel slag (fertilizer)

[Fertilizer] Steel slag + humus soil

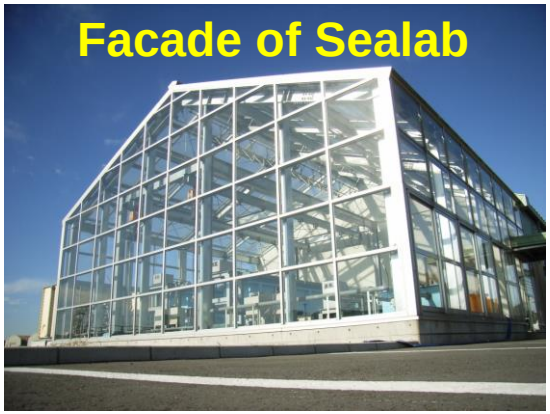
Carbonated steelmaking slag (Iron source) + Humus soil (humic acid) = **Vivary™ Unit**

【Patent No. 3829140】

●Effects of fertilizer application in the actual sea - Improving the certitude of seaweed bed restoration

[Approach]

- Clarifying environmental conditions for stable supply of iron ions under ideal conditions (within the Sealab) with no disturbance factors
- Improving the certitude of restoration through data accumulation and model analysis/construction for nationwide development of various types of seaweed beds



Equipment and Functions of the Sealab

- ●Shallow and tidal flat tanks
- ●Wave generator
- ●Tide setting function
- ●Water temperature control function
- ●Sunlight control function

(3) Verification and Expanded Application in the Actual Sea

	Lacation	Co-implementer	Fertilizer	Amount of fertiliser	Date of completion of construction
①	Mashike Town,Hokkaido	Mashike Fishery Cooperative Association	Vivary™ Unit	22.5tonne	2022.11.9
②	Tomari Village,Hokkaido	Furuu District Fishery Cooperative Association	Vivary™ Unit	31tonne	2022.11.6
③	Onagawa Town,Miyagi	Miyagi Prefecture Fishery Cooperative Association (Onagawa Branch)	Vivary™ Unit	26tonne	2022.10.12
④	Shima City, Mie	Miegaiwan Fisheries Cooperative Association	Vivary™ Unit/ Vivary™ Rock	10tonne	2022.10.7
⑤	Furubira Town, Hokkaido	Higashi shakotan Fishery Cooperative Association	Vivary™ Unit	6tonne	2022.10.3
⑥	Shikabe Town, Hokkaido	Shikabe Fishery Cooperative Association	Vivary™ Unit	8tonne	2022.10.7

Burying Vivary™ Units in Furubira Town

Sinking Vivary™ Units in Tomari Town

Installing Vivary™ Rocks as a substrate material for seaweed settlement

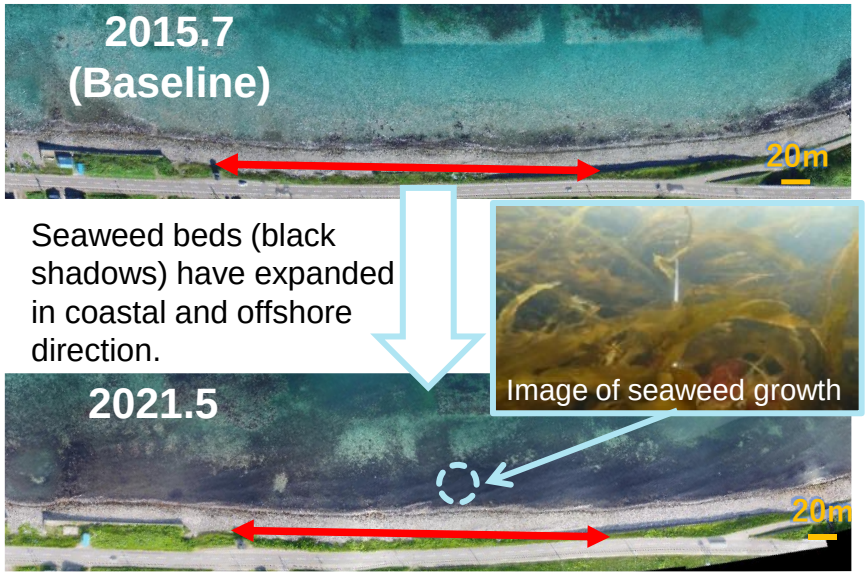
04 Seaweed bed creation in Mashike Town,Hokkaido (Nippon Steel Corporation)

Hokkaido & Tohoku

Working with fishermen since 2004 to prevent the *Isoyake*, Sea Desertification.

Overview

- *Isoyake* has spread in the early 2000, causing decline in the number of fish catches.
- Focusing on the fact that iron deficiency in the sea area could be a factor in *Isoyake*, an iron-supplying fertilizer (Vivary™ Unit) for seaweed bed propagation was Developed.
- Continuous verification in progress in the actual sea since 2004 in cooperation with the Mashike Fishery Cooperative Association.



Basic Information

Region	Mashike Town
Participating organizations	Nippon Steel Corporation,Mashike Fishery Cooperative Association
Start year	2004
Contents of activities	• Technology development (verification of seaweed bed decline mechanism and development of seaweed bed restoration technology) • Improvement of bottom sediment (burial and sinking of fertilizer materials that supply Fe ions)
Site area	3.4ha (Seaweed bed area,2022)
Amount of CO2 absorption	49.5t-CO2 (J Blue Credit, 5 years from FY2018 to FY2022:49.5t-CO2)

Seaweed bed creation in Mashike Town, Hokkaido

- Working with fishermen since 2004 to develop measures to prevent *Isoyake*-

1. Overview

- Issue: *Isoyake* has spread in the early 2000, causing decline in the number of fish catches
- Focusing on the fact that iron deficiency in the sea area could be a factor in *Isoyake*, an iron-supplying fertilizer (Vivary™ Unit) for seaweed bed propagation was developed. Continuous verification in progress in the actual sea since 2004 in cooperation with the Mashike Fishery Cooperative Association

Before implementation

Appearance of fertilizer

Burying of fertilizer

2005: Kelp thriving on the coast as a result of fertilization

2. Main Projects and Results (Remarkable points)

	Details
Technology development	Scientific verification that iron ions are essential for kelp growth ⇒ Developed technology to artificially supply iron ions and conducted experiments in actual sea areas
Fishing grounds improvement	Contribution to increase in fish catch (including results of other efforts by fishery cooperatives, etc.) ⇒ Sea urchin catches increased due to the growth of kelp.
Credit acquisition	Joint credit acquisition with Mashike Fishery Cooperative Association ⇒ J Blue Credit Certification 49.5t-CO2 (for the past 5 years)
Societal awareness	Publicity through various media Cooperating with Dr. Yamamoto, University of Tokyo, in field classes

Overview of seaweed bed expansion in J Blue Credit application

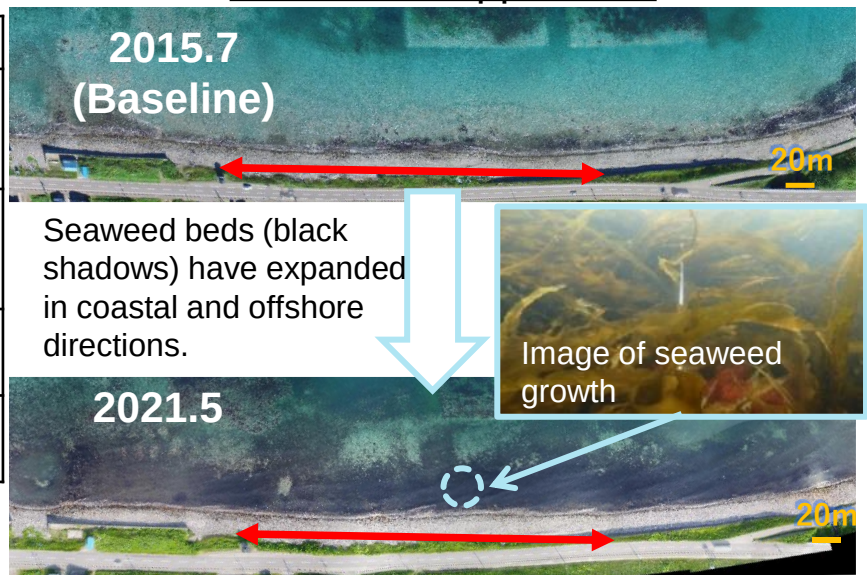
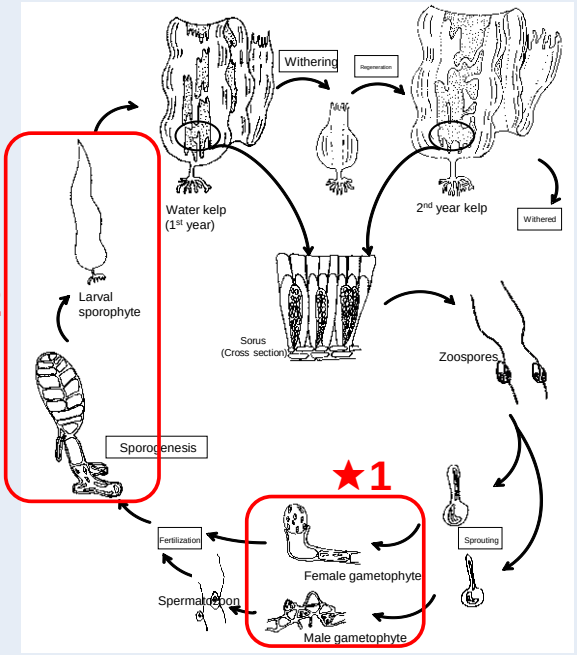


Figure: Expansion of seaweed bed (drone image)

Mechanism of the *Isoyake* caused by Fe ions deficiency

● Fe ions necessary for the life cycle of seaweeds

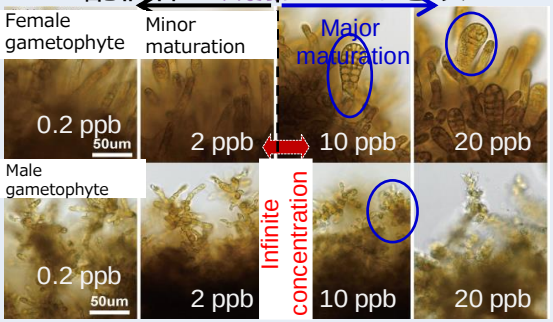


Life Cycle of Laminaria Plants

● Experimental addition of Fe ions to kelp

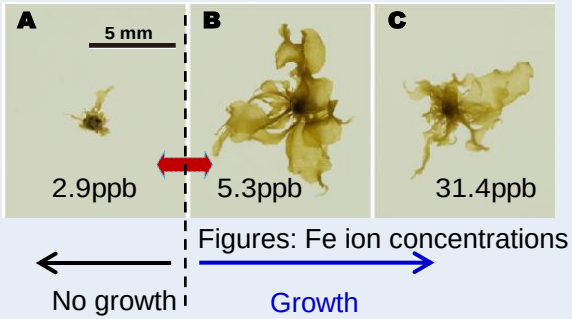
(Ueki et al., Nippon Steel Technical Report No. 391, 2011)

★ 1 Fe ions are required for gametophyte maturation



Figures: Fe ion concentrations

★ 2 Fe ions are required for sporophyte growth



The presence of Fe ions is essential for the life cycle growth process of sweet kelp.

● Mechanisms for Estimating the Isoyake

(Matsunaga et al. 1994)

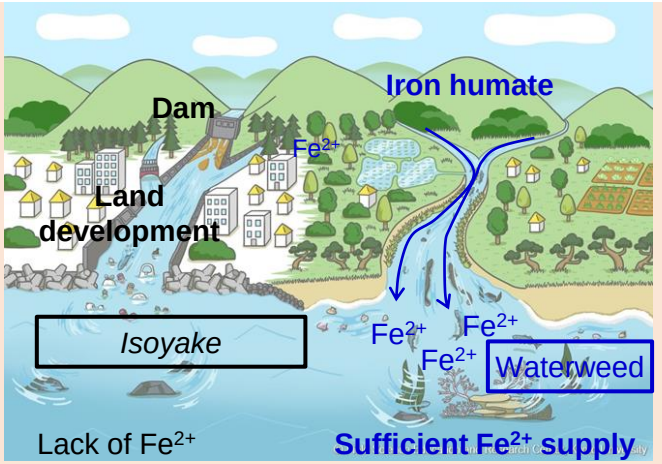
Originally, Fe ions in soil combine with humic acid to form iron humate and runoff to coastal areas through rivers (→ supply of Fe ions)

⇩

Decrease in iron humate supply due to terrestrial development and dam construction

⇩

Lack of iron humate (Fe ions) in coastal areas causes *Isoyake*



(Field Science and Research Center, Kyoto University)

Overview of Seaweed Bed Restoration through Fe Supply (Vivary™ Unit)

- **Supply of humic acid iron (Fe ions) using steel slag (by-product in steelmaking)**

Steel slag (Fe source)

Dissolved O_2 in water

Fe^{2+} → Fe^{3+} → **$Fe(OH)_3\downarrow$ (Insolubled)**

Does not provide a supply of Fe ion

Humus (Humic acid)

Humic acid

(Carboxyl group: -COOH)

(Phenolic hydroxyl group: -OH)

Iron humate (dissolved)

Supplies Fe2+ ions in seawater

Development of Vivary™ Unit

(steel slag + humus soil)

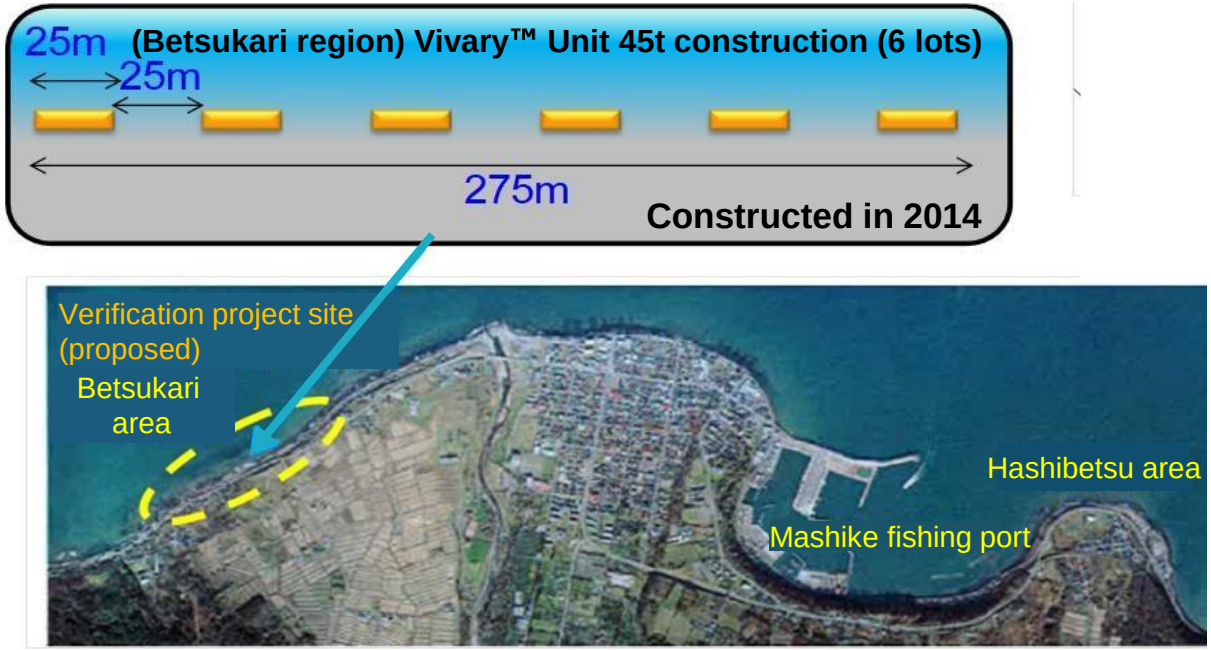
- **Material: Steel slag + Humus soil**
- **Principle: Reproduction of Fe ion supply mechanism from terrestrial area by utilizing steel slag**

Promotes seaweed bed formation by artificially generating and supplying iron humate (Fe ions), which is essential for seaweed growth.

Projects in Betsukari, Mashike Town, Hokkaido, Japan (2018-2022)

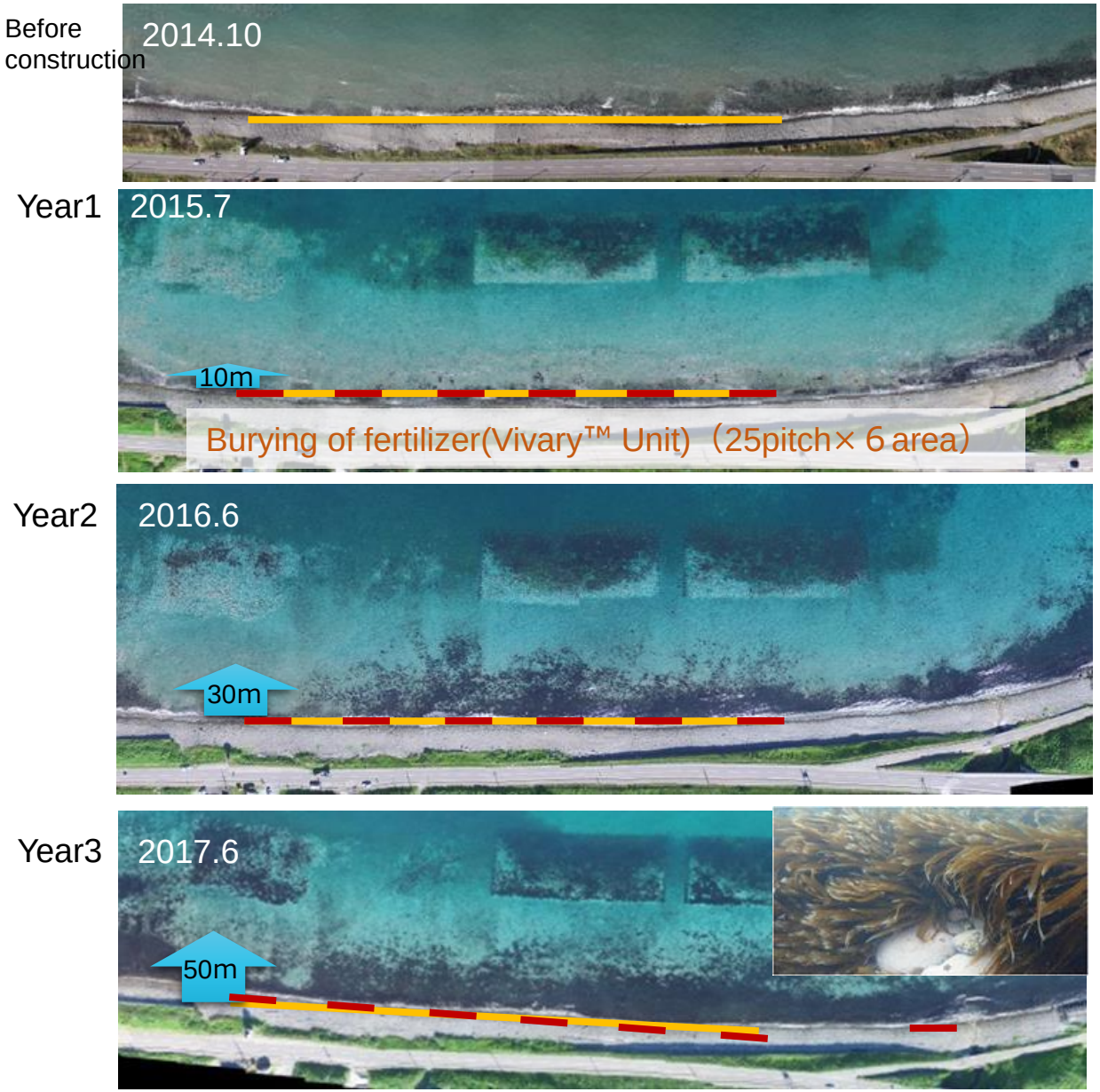
- **Large-scale verification project in Mashike Town, Hokkaido (Betsukari Coast) (2014)**

Source: Google Map

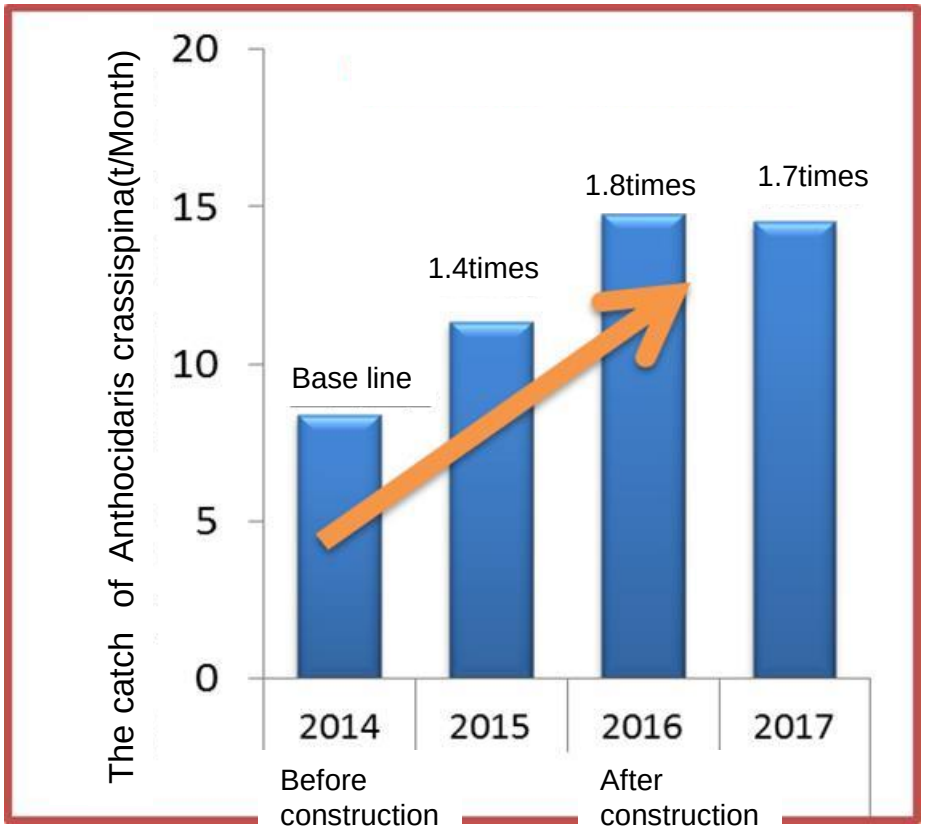


Expansion of Seaweed Bed and Improvement in Sea Urchin Catch

● **Large-scale verification project at Betsukari, Mashike Town, Hokkaido: Evaluation of seaweed beds and fisheries value**



Aerial photograph of Betsukari area



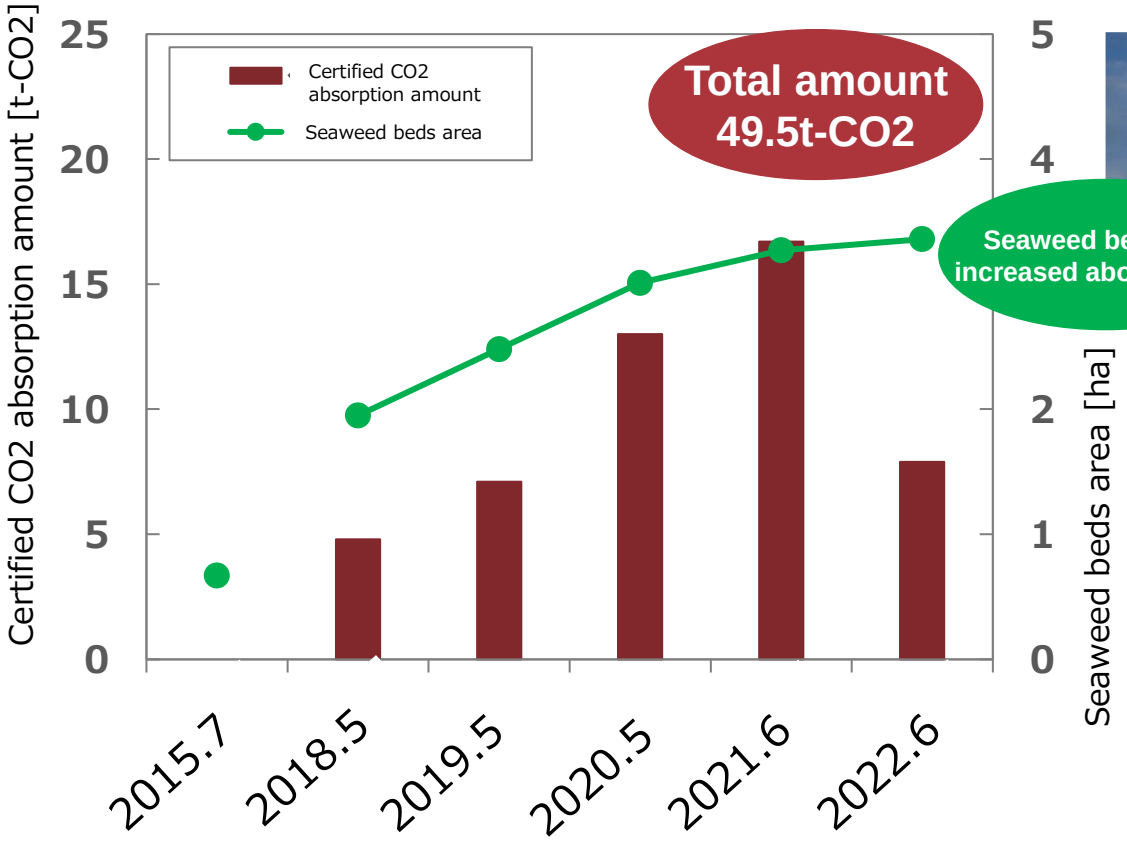
Seaweed beds are gradually expanding after 3 years of construction

・Seaweed beds have regenerated up to 50m offshore

・Sea urchin catch has also increased (Evaluation by the entire Mashike fishing group)

Acquiring J Blue Credit™ (2022)

Amount of credit certification ($t\text{-}CO_2$) = (**Seaweed bed area (ha)** × **Certainty (90%)**) × (**Coefficient of absorption ($t\text{-}CO_2$/ha/year)** × **Certainty (80%)**) − **Baseline BC amount ($t\text{-}CO_2$)** − **CO_2 emissions from research boat ($t\text{-}CO_2$)**



Seaweed beds created by the Vivary™ Unit received J Blue Credit™ certification for the first time (49.5 t-CO2 in the total of 5 years). The certification system will spur our company's efforts in the future.

05 Creation and conservation of seaweed beds using propagation trenches in Hirono Town, Iwate Prefecture (Hirono Town)

Hokkaido & Tohoku

Creating an environment conducive to the growth of seaweed, thereby creating and preserving seaweed beds.
Contributing to the fixation of CO2 on the seafloor by flowing algae.

Overview

- In the town of Hirono, trenches have been dug in the flat bedrock of the coast to create an environment where seaweed can thrive unaffected by the tides, which has been used for sea urchin and abalone fishing.
- The seaweed that has grown in and around the trenches dug into the bedrock flows out to the sea as drift weed when the tide ebbs and flows, contributing to the fixation of CO2 on the seafloor.
- The use of breeding trenches not only for seaweed bed conservation but also for sea urchin and abalone fishing has enabled the harvesting of high-quality sea urchins, achieving sustainable fisheries and climate change countermeasures.

Basic Information

Region	Hirono Town
Participating organizations	Hirono Town Blue Carbon Council
Start year	2017
Contents of activities	• Creation of seaweed beds using propagation trenches and adjustment of external forces (waves and currents)
Site area	—
Amount of CO2 absorption	3,106.5t-CO2 (J Blue Credit,5years from FY2017 to FY2021:3,106.5 t-CO2)

Project Features – Strengths

Beach cleanup
(Extermination of whelks)

Forestation for sea urchins
Arbor Day

- The total distance of the 178 propagation trenches is approx. 17.5 km, with a width of approx. 4 m and a depth of approx. 1 m.
- The structure allows fresh seawater to flow in even at low tide, creating an environment conducive to the growth of large seaweeds such as wakame seaweed and kelp.
- The seaweed that has grown in and around the trenches dug into the bedrock flows out to the sea as drift weed when the tide ebbs and flows, contributing to the fixation of CO2 on the seafloor.
- The propagation ditch has led to an abundant harvest of high quality, well-filled northern sea urchins, and a sustainable fishery that combines sea urchin fishing and seaweed bed conservation, in other words, climate change countermeasures, has been passed down from generation to generation.
- Funds obtained from the sale of credits will be used for further efforts to combat climate change, mainly by the Hirono Town Blue Carbon Council.

Breeding Ditch, distant view

Hirono Town Blue Carbon Council

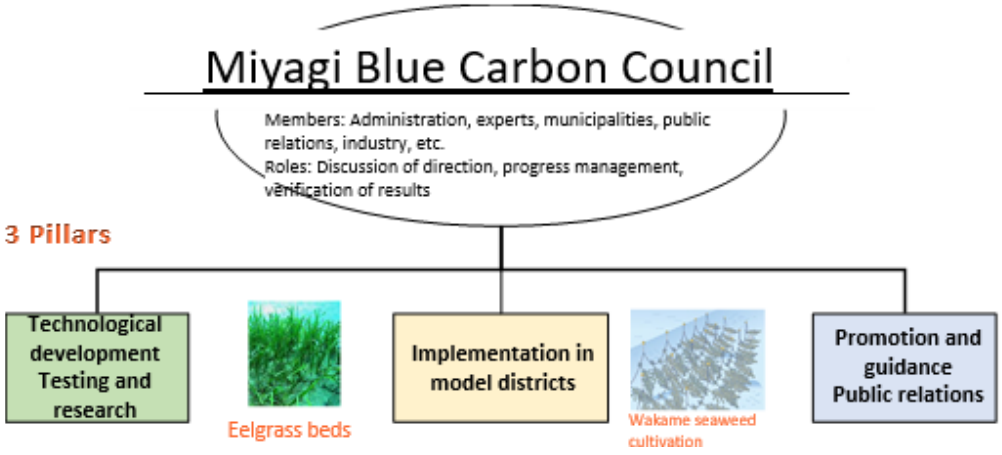
06 Miyagi Blue Carbon Project (Miyagi Prefecture)

Hokkaido & Tohoku

Organizing CO2 fixation and emission intensity, cultivation and creation of laminaria religiosa kelp and sea oak kelp in model areas.
Spreading awareness through website and hands-on learning.

Overview

- Organizing CO2 fixation and emission intensity (inventory) as part of technology development and pilot studies.
- Creating seaweed beds of laminaria religiosa kelp and sea oak kelp in model areas to study business productivity and environmental impact.
- Holding seminars and symposiums, operating a website, and conducting hands-on learning for the purpose of promoting public awareness.



Basic Information

Region	Miyagi Prefecture
Participating organizations	Miyagi Blue Carbon Council (Japan Blue Economy Association,Japan Fisheries Research and Education Agency,Sakana Design LLC., Miyagi Prefecture Fisheries Cooperative Association, General Incorporated Association Fisherman Japan, Ishinomaki City Hall, Miyagi Prefectural Government)
Start year	2021
Contents of activities	• Technology development(organizing CO2 fixation and emission intensity) • Cultivation and seaweed bed creation • Environmental education and raising awareness(organisation of symposia, etc.)
Site area	–
Amount of CO2 absorption	158.3 t -CO2 (2022, provisional figure)

New global warming solutions! About Blue Carbon

MIYAGI Blue Carbon Project
宮城ブルーカーボンプロジェクト

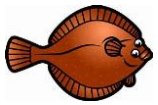
Objective: To **evaluate the amount of carbon dioxide fixation and absorption as a multifaceted function of the fishing industry as blue carbon** in the course of promoting efforts to create and preserve seaweed beds and increase seaweed cultivation in the coastal areas of Miyagi Prefecture. The objective of this project is to contribute to the carbon neutrality and sustainability of the prefectural fishing industry by **quantifying the environmental impact generated by the industry and clarifying the degree of contribution to reduction**, thereby fostering momentum toward an environmentally conscious fishing industry.

Calculating the amount of CO2 fixed by seaweed

Miyagi Blue Carbon Council

Members: Administration, experts, municipalities, public relations, industry, etc.
Roles: Discussion of direction, progress management, verification of results

Creation of seaweed beds, isoyake countermeasures, sea urchin extermination and effective utilization

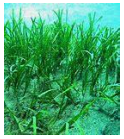


What about CO2 from fishing activities and consumption of catches!?

3 Principles

Technological development Testing and research

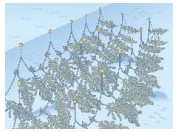
- Collection, organization, and creation of CO2 fixation and emission units (inventory)
- Understanding seaweed bed areas (by seaweed species)
- Calculation of CO2 emissions by fishery type, fish species, etc.



Eelgrass beds

Implementing in model districts

- Setting up a model district and studying business productivity and environmental impacts associated with seaweed bed creation and seaweed cultivation



Wakame seaweed cultivation

Promotion and guidance Public relations

- Public awareness activities (general publicity, blue carbon education, collaborative projects with aquariums, etc.)
- App development

Promotion and public relations activities

(1) Technology Development, Testing and Research

- Organizing inventory (CO2 fixation/emission intensity) to enable calculation of CO2 absorption/fixation and CO2 emissions from fisheries and aquaculture as blue carbon
- We collected unit requirement data on 50 cases in FY 2008 and 60 cases in FY 2022 and estimated the amount of CO2 fixed and CO2 emissions based on the data of the fishing industry in the prefecture.

○Examples of inventories collected (CO2 fixed intensity)

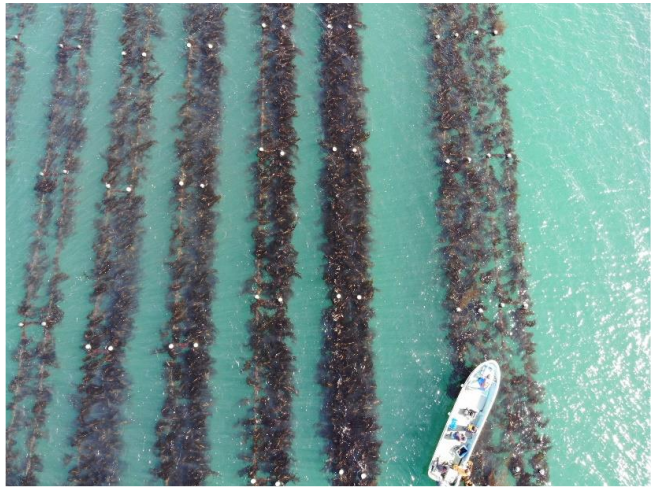
No.	Name	CO2 fixation /emission intensity (t-CO2/ha/year)	Year of publication
1	Seagrass beds	5.8	2013
2	Sargassum beds	2.7	2013
3	Kelp beds	10.3	2013
4	Arame beds	4.2	2013
5	Mangrove forests	68.5	2013
6	Wetlands and tidal flats	2.6	2013

*Average values

(source:IPCC Wetland Guidelines)

(2) Implementation in the Model Area

- Seedling collection and cultivation trials are being conducted in model areas from FY2013.
  Ishinomaki branch of the Miyagi Fishery Cooperative Association: Trials using kelp
  Ajishima branch of the Miyagi Fishery Cooperative Association: Trials using sea oak
- Collected growth data of cultured wakame seaweed at three locations in Miyagi Prefecture (Kesennuma City, Minamisanriku Town, and Ishinomaki City)
- Organizing and technologizing the conditions necessary for seaweed bed creation and cultivation, and promoting evaluation as blue carbon (for obtaining credits)



(3) Promotion Guidance and Public Relations

- Seminars and symposiums were held in FY2022 to promote the basics of blue carbon and its initiatives, and were attended by many people from different industries, including fishermen.
- Collaboration with a local aquarium to hold hands-on learning events for elementary and junior high school students
- We have promoted publicity by launching a website and using magazines and other media to increase momentum for a sustainable fishing industry.

Miyagi blue carbon project Website

Website URL： https://miyagi-coast.jp/bcp/

Roadmap of the Miyagi Blue Carbon Project

<Objectives>

・In promoting efforts to create and conserve seaweed beds and increase seaweed cultivation in the coastal areas of Miyagi Prefecture, the project aims to reduce CO2 emissions by an average of 250 t-CO2/year through seaweed cultivation and seaweed bed creation, aiming to reduce 2,500 t-CO2 in total over 10 years.

・In addition, the CO2 emitted from the fishing industry will be quantified and the amount that contributed to reduction will be clarified, while considering to implement an offset system. The aim is to make the fishing industry a sustainable and dynamic industry that is in harmony with the environment

Number of years after the start of the project	FY2021-2023 (1st-3rd year)	FY2024 - FY2027 (4th - 7th year)	～FY2030 to FY2030 (8th to 10th year)
Project Description	**Blue Carbon Council and Three Principals (Implementation Phase)** (1) Technology development and pilot studies (2) Implementation in model districts (3) Promotion and public relations activities	**Blue Carbon Utilization (Growth Phase)** (1) Pilot introduction of offset system (2) Inter-regional collaboration and horizontal development	**Blue Carbon Operation (Mature Phase)** **Establishment of Blue Carbon system**
Issues •Assessment technology •Seagrass bed creation •Fundraising •Raising awareness •Short-term Initiatives	Short-term Initiatives: Establishing foundation of blue carbon Development and evaluation of assessment technology, and raising awareness Medium-term initiatives: Creation of seaweed beds and increasing seaweed cultivation Decarbonization of fisheries based on scientific data	• Calculate the Blue Carbon (understanding CO2 fixation) • Implementing an offset system for the fishing industry • Creating new values for the fishing industry • Fostering momentum through regional collaboration and horizontal development • Increasing corporate participation and securing funding by raising awareness	Carbon dioxide fixation amount by 2030 250t-CO2/year x 10 years = **2,500t-CO2**

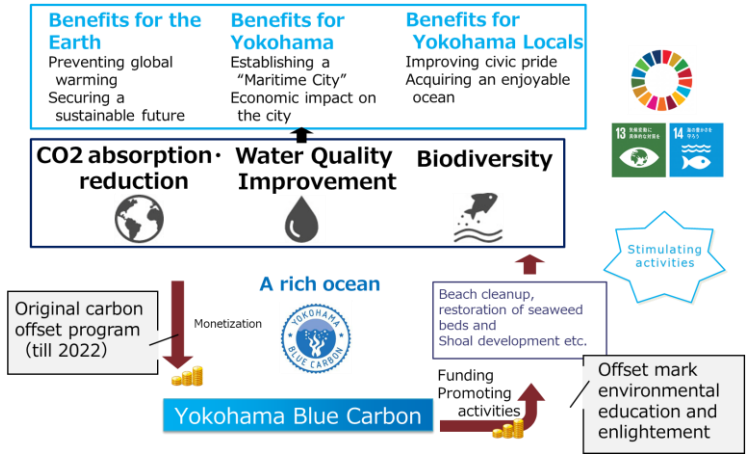
07 Yokohama Blue Carbon Project (Yokohama City)

Kanto

Promoting measures to combat global warming and create a friendly ocean for Yokohama citizens.

Overview

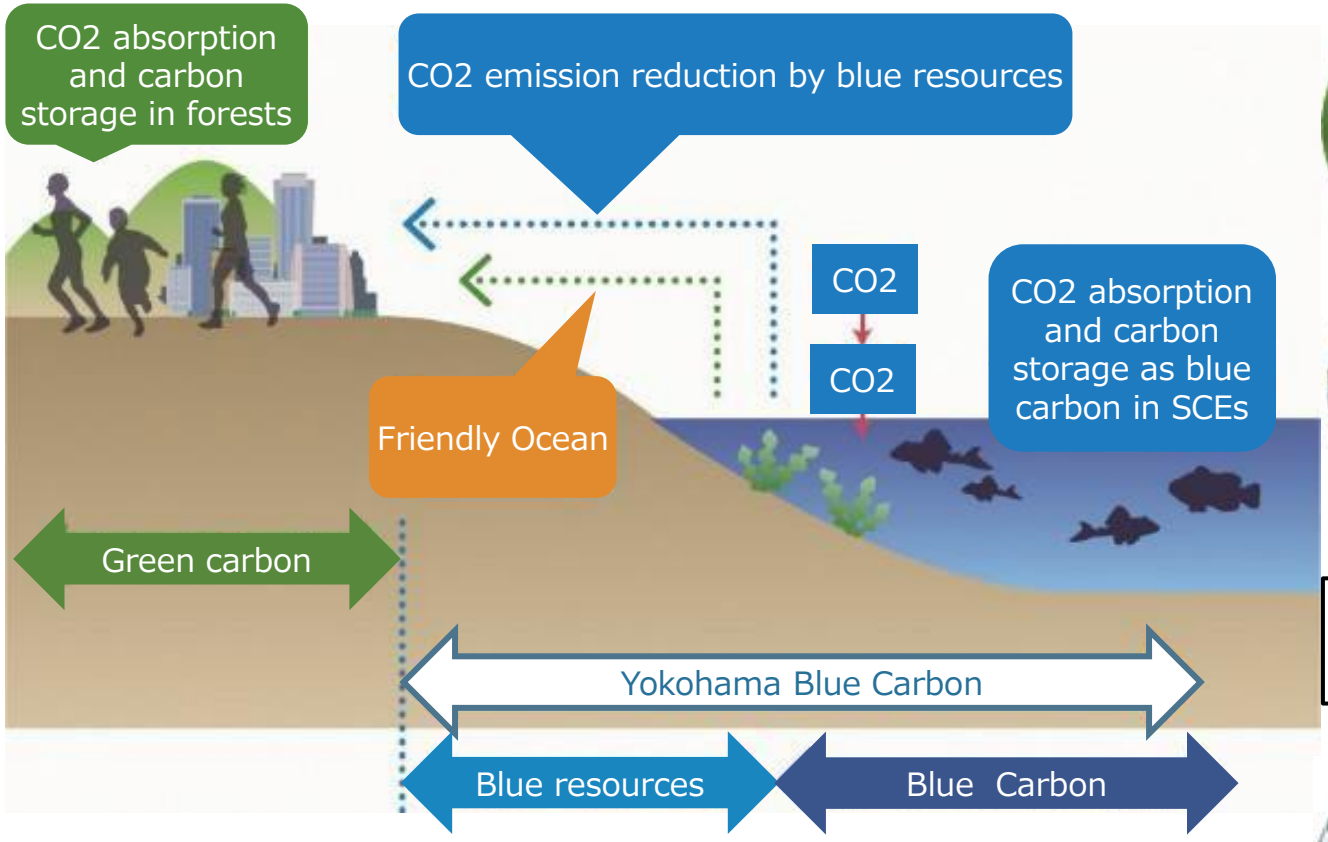
- Yokohama City's own Blue Carbon Offset System in operation. (Ended in 2022)
- As an example, the Yokohama City Fisheries Cooperative Association obtained credits for seaweed and kelp cultivation and used the proceeds from the credits to pay for seaweed bed monitoring and other expenses.
- In collaboration with Yokohama Hakkeijima Sea Paradise and other organizations, educational events are held for citizens and businesses with the aim of creating an ocean that is enjoyed by the public.



Basic Information

Region	Yokohama City
Participating organizations	Yokohama City, Yokohama Hakkeijima Sea Paradise,Yokohama City Fisheries Cooperative Association
Start year	2014 (Blue Carbon Offset System Ended in 2022)
Contents of activities	• Operation of the Blue Carbon Offset System • Environmental education and raising awareness(Holding awareness raising events)
Site area	–
Amount of CO2 absorption	312.8t-CO2 (Yokohama Blue Carbon Offset System,FY2022:312.8t-CO2)

Yokohama Blue Carbon



CO2 Reduction Projects

Blue Carbon

Absorption and fixation of CO2 by marine ecosystems

Blue Resources

Utilization of energy and other resources in waterfront areas

Environmental Education・Enlightenment

Creating a friendly ocean

Aim of the Yokohama Blue Carbon Project

Benefits for the Earth
Preventing global warming
Securing a sustainable future

Benefits for Yokohama
Establishing a "Maritime City"
Economic impact on the city

Benefits for Yokohama Locals
Improving civic pride
Acquiring an enjoyable ocean

CO2 absorption・reduction

Water Quality Improvement

Biodiversity

Stimulating activities

Beach cleanup, restoration of seaweed beds and Shoal development etc.

A rich ocean

Original carbon offset system (Ended in 2022)

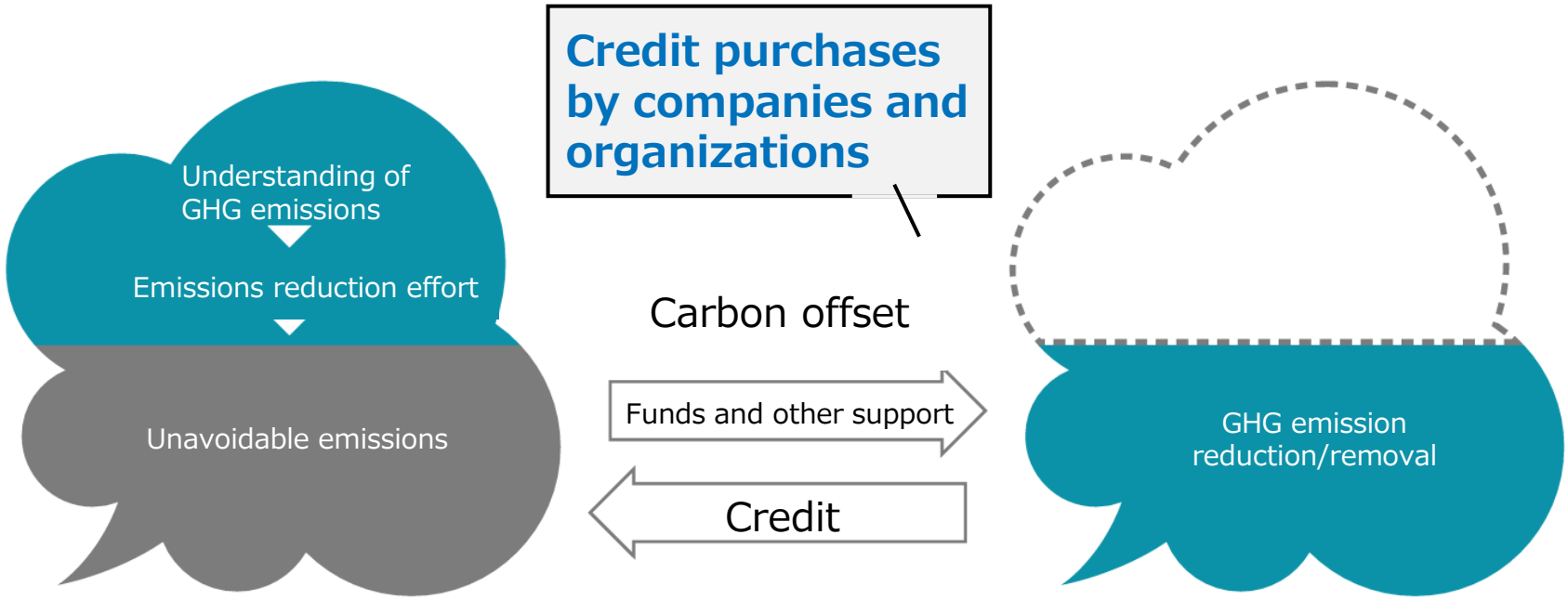
Monetization

Yokohama Blue Carbon

Funding
Promoting activities

Offset mark environmental education and enlightement

Yokohama Blue Carbon Offset System（Ended in 2022）



【CO2 emitting companies and associations (Credit purchaser)】

・Indirect reduction of CO2 emission
・Support of marine environment activities
⇒Improvement of organizational value through social contribution

【CO2 reduction and absorption activities (Credit creator)】

・Securing activity funds
・Enhancing social recognition
⇒Revitalization of initiatives and improvement of sustainability

Examples of the use of credits with Blue Carbon

LNG-fuelled tugboats operated by maritime companies

Revenue from credits is used for LNG fuel for tugboats, etc.

Air conditioning with seawater heat pumps by an amusement company

Credit proceeds are used to pay for seeds and ropes for wakame seaweed planting, etc.

Yokohama City Fisheries Cooperative Association(Cultivating Wakame Seaweed)

(Cultivated Kelp)

Revenue from credits are used for monitoring costs of seaweed beds, etc.

Creating a friendly ocean

In Cooperation with Yokohama Hakkeijima Sea Paradise

August
‘Green Kids’
Creatures of Tokyo Bay
Watching Tour

This event allows visitors to observe the creatures that live in Tokyo Bay. The staff will give you a lecture while collecting and interacting with the creatures.

December
Wakame Seaweed planting event

Children plant wakame seaweed at the aquarium 'Umi Farm'. After learning about the importance of blue carbon, the children tie the 10cm long wakame seedlings to a rope. The seaweed grows in the sea until it is harvested.

Wakame
seaweed seeds

March
Wakame Seaweed harvesting event

Harvesting the wakame seaweed planted in the planting event. The children learn the importance of blue carbon while harvesting the seaweed with a rope pulled up from the sea. The planted wakame Seaweed grows to about 1 m in one month.

08 Sea Forest Creation Activities in Hayama Town through Cooperation of Various Actors (Kajima Corporation)

Kanto

Implementing initiatives that promote education, local economies, and decarbonization through regional cooperation in seaweed bed restoration activities that utilize seedling production technology.

Overview

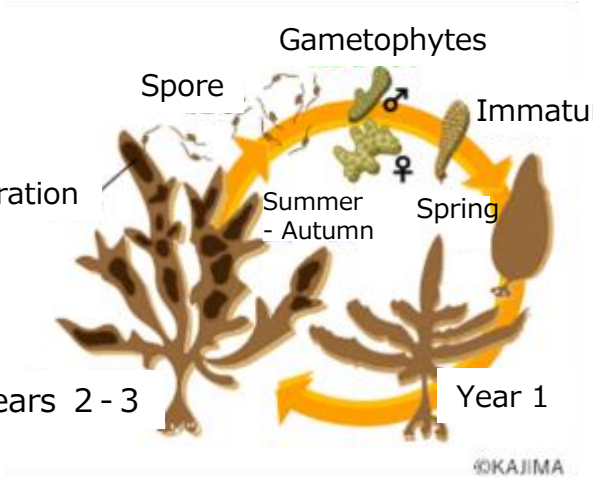
- In the Hayama Sea area, the decline of seaweed beds has progressed rapidly over the past several years. Through proactive efforts to restore the seagrass beds in collaboration with the local community, we are implementing initiatives that will promote education, the local economies, and decarbonization.
- The Hayama Fisheries Cooperative Association and local divers are working together to conserve eelgrass beds and seaweed communities while creating blue carbon through aquaculture by utilizing seedling production technology.
- Environmental education is being conducted at schools, and economic benefits are expected from morning markets and other activities.

Basic Information

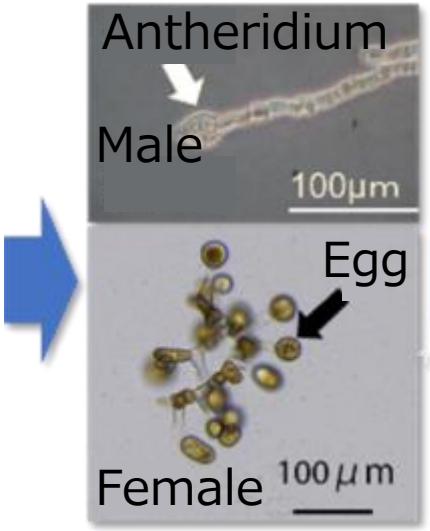
Region	Hayama Town (Kanagawa Pref.)
Participating organizations	Hayama Eelgrass Council (Hayama Town Fisheries Cooperative Association, Isshiki Elementary School, Diving Shop Nana, Kajima Corporation)
Start year	2006
Contents of activities	• Seeding of seaweeds and transplanting of sporophyte • Removal of pests • Additional efforts in aquaculture • Restoration of fishing grounds through active fisheries enhancement • Environmental education and raising awareness
Site area	Approx. 10ha
Amount of CO2 absorption	46.6 t-CO2 (J Blue Credit, FY2022:46.6 t-CO2)

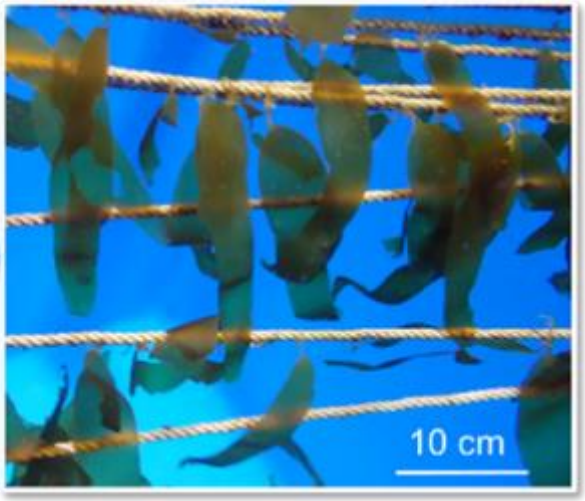
Utilizing seedling production technology developed by Kajima Construction Co.

Provides technology to produce seedlings of brown algae (*Eisenia,Ecklonia cava*, etc.) endemic to the region throughout the year.



Isolation and culture of gametes (free-living gametophytes)





Promotion of seaweed maturation

Seaweed seedling production

Seaweed bed restoration activities through regional cooperation using the seedling production technology

Farming of seaweed by fishermen

Seed production technology for seaweeds using free-living gametophytes

・Creating Blue Carbon
・Creating jobs with a better condition of the primary industry

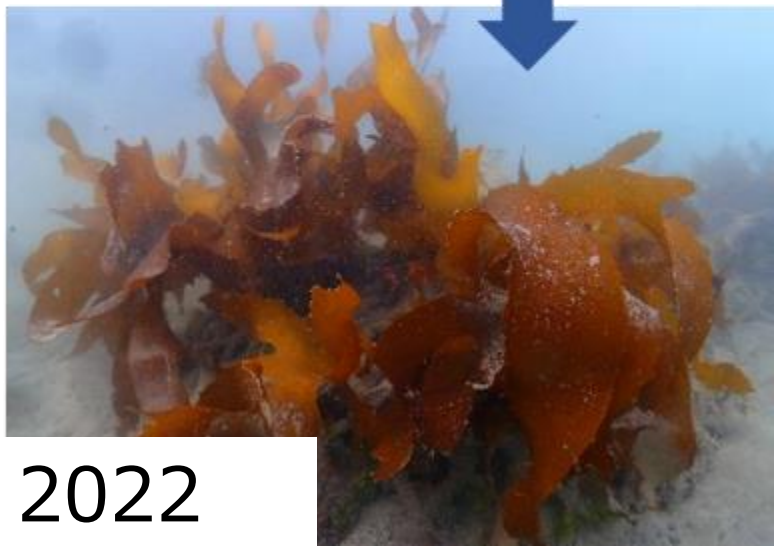
Restoration activities of seaweed by divers

・Creating Blue Carbon
・Getting familiar with the natural environment
・Education /Enlightenment

Seaweed bed restoration trials in fishing ports and general sea areas using the seedling production technology

2021

Hayama Port
(depth 2~3m)
Transplantation test of *Eisenia bicyclis* seedling

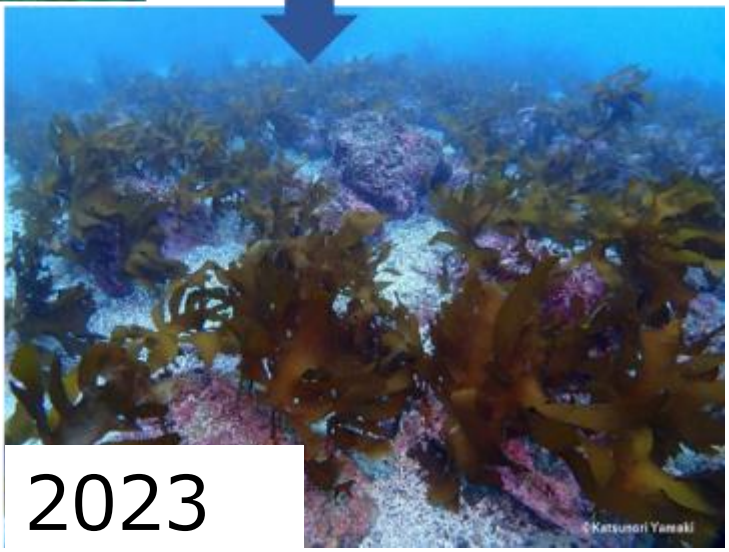


2022

Restoration of seaweed beds in ports and harbors

2021

Offshore Of Hayama
(depth 10～12m)
Transplantation test of *Ecklonia cava* seedling



2023

Restoration of seaweed beds in the general sea area

Effects of creating blue carbon credit

Jブルークレジット発行証書

J-Blue Credit Certificates

葉山アマモ協議会　殿

以下のとおり、クレジットを発行したことを証明します。

Jブルークレジット発行量

46.6 t - CO_2

プロジェクトの名称：葉山町の多様な主体が連携した海の森づくり活動

プロジェクトの種類：自然系炭素除去

クレジット発行番号：202211JBCT00022-001 － 202211JBCT00022-00466

JBE

発行年月日　令和５年２月10日

Sustainable activities for seaweed bed restoration, carrying out community awareness activities
Holding a blue carbon study group with credit purchasing firms.

Blue Carbon Study Group

Releasing juvenile turban shells into regenerating seaweed beds

Promotion of local seafood

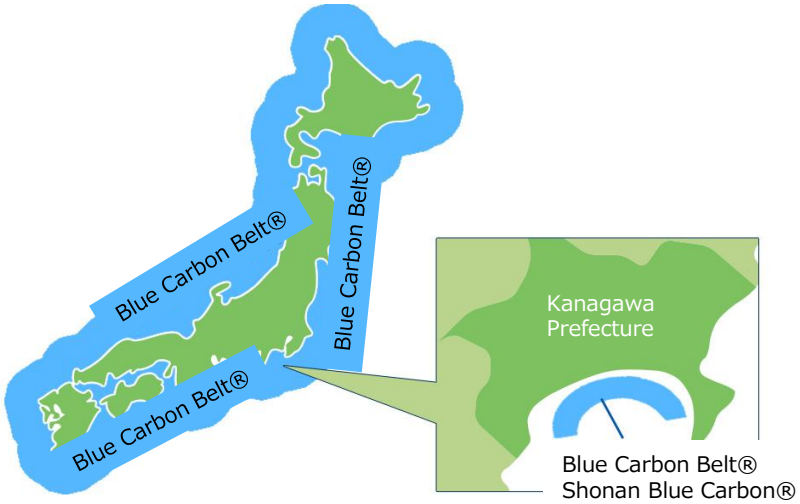
09 Efforts to establishing the “Blue Carbon Belt®” (Blue Carbon Belt Riviera Institute)

Kanto

Branding “Shonan Blue Carbon®” by establishing the “Blue Carbon Belt®” in Sagami Bay while aiming to expand the “Blue Carbon Belt® ” along the entire coast of Japan.

Overview

- Advocating for the “Blue Carbon Belt®” to connect seaweed beds in a belt-like formation and aiming to expand it to the entire coastline of Japan.
- In order to establish the "Blue Carbon Belt®" in Sagami Bay, the institution will collaborate with existing seaweed bed restoration organizations and other related parties, while establishing the brand of “Shonan Blue Carbon®.” In addition to removing marine debris and conducting beach cleanups, the broader community as a whole, including urban areas, will engage in sustainable activities to eliminate the sources of marine debris.
- Engaging in seaweed bed restoration activities using the company’s marinas (Riviera Zushi Marina and Riviera Seabornia Marina) in Kanagawa Prefecture.



Basic Information

Region	Kanagawa Prefecture (Sagami Bay)
Participating organizations	Blue Carbon Belt Riviera Institute, Riviera Future Creation Project, Riviera Resort Co., Ltd.
Start year	2022
Contents of activities	• Technology development （Seaweed bed creation, Seaweed bed surveys） • Environmental education and raising awareness
Site area	–
Amount of CO2 absorption	–

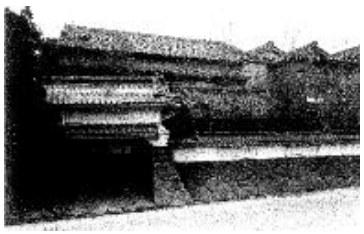
Initiatives of the Riviera Group

- The Riviera Group began environmental activities in 2001 with a sense of urgency about climate change at the same time it launched its marina business.
- In 2006, the Riviera Group launched the “Riviera Future Creation Project” that involves all employees, with environment, education, and well-being as the three principles of the project, establishing a nature-positive system.
- As a marina operator at the junction of the sea and the land, we have established an eco-system in 2006 to create an environmentally friendly cycle both at sea and on land, by routinely removing marine debris and conducting beach cleanups, and by providing "Riviera Circulating Vegetables" (vegetables that circulate in Shonan) for complete food circulation (restaurant and banquet → compost onsite → local farmers and our own vegetable garden → restaurant). In 2006, the company established an eco-system of complete food circulation (restaurants and banquets → on-site composting → local farmers and the company's vegetable garden → restaurants), contributing to the revitalization of the regional economy and achieving zero-waste and a significant reduction in CO2 emissions for 18 years. The first marina in Asia to be awarded the Blue Flag*, which is a trend in the environmentally conscious EU as a standard for selecting travel destinations. Currently the only one in Asia.
- Since 2020, the company launched the “LOVE OCEAN Project,” a wide-area regional development project in collaboration with 13 cities and towns along the Kanagawa Prefecture coastline surrounding Sagami Bay. In addition to various sustainable events such as beach cleanups, the company is engaged in dialogue with fishery operators, marine businesses, and experts ascertain information on the current status of the sea and revitalize the local community from the sea.
- Established the Blue Carbon Belt Riviera Institute as a general incorporated association to promote environmental education and further expand the scope of its activities.

*More than 5,000 marinas worldwide have obtained Blue Flag certification (only 15% of marinas with more stringent requirements have obtained this certification), and only 11 locations in Japan (1 marina and 10 beaches) have obtained Blue Flag certification.

1980

Riviera Tokyo (Ikebukuro, Opened in 1950) started sustainability as a regional development in the “food field” at its former ryotei restaurant “Hakuunkaku.”



2001

Acquired a marina.
Started environmental activities with a sense of crisis over climate change.

2006

Launched the "Riviera Future Creation Project" with the three pillars of the environment, education, and health and medical care.
・All employees are involved in the project and collaboration with industry, academia and government.
・Established the “Riviera Circulating Vegetables” eco-system in Shonan.

2015

Adopted as SDGs in 2015

SUSTAINABLE DEVELOPMENT GOALS

・Promoting the SDGs through the Riviera Future Building Project
・SDGs platform of the Ministry of Foreign Affairs of Japan
・Plastic Smart

UN GLOBAL COMPACT

From 2019: Signed and submitted the Global Compact to the UN

100%reusable energy introduction

2020

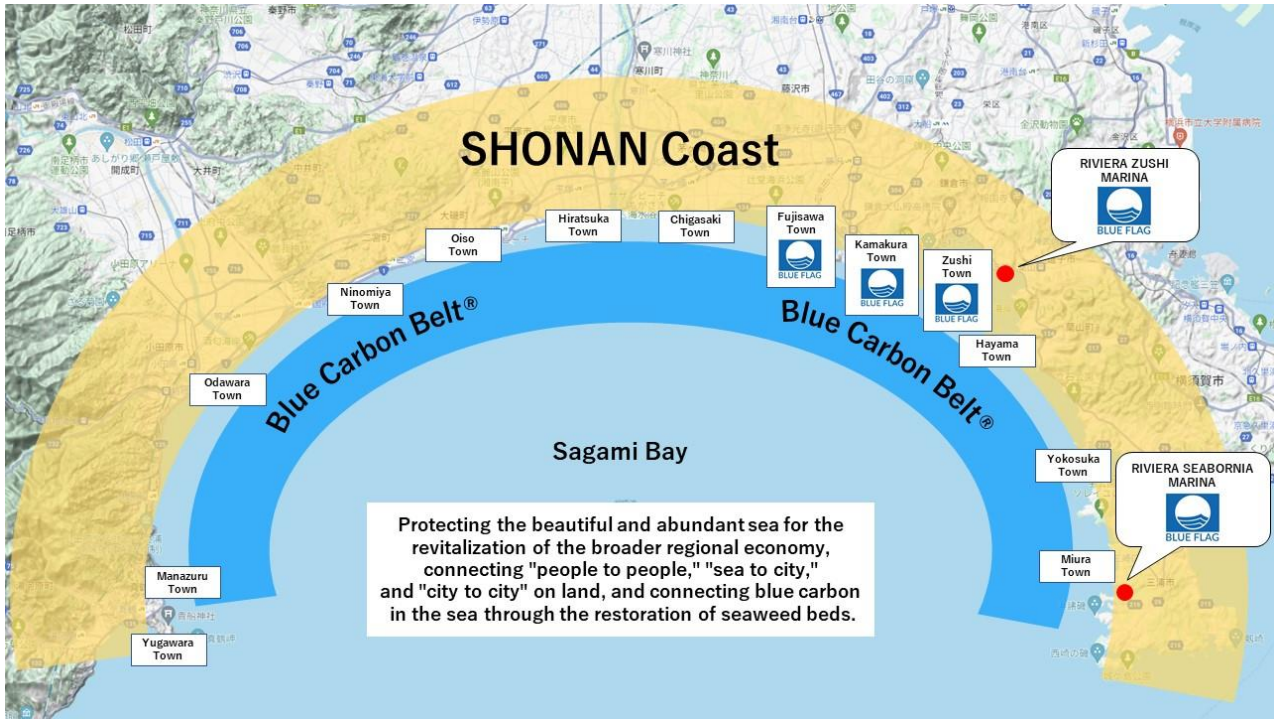
Malibu Hotel Japan's first V2B2020 Establishment of NPO
・Start of Riviera SDGs festival
・Riviera SDGs Artwork and Manga Grand Prix begins.
・LOVE OCEAN Project started
2022 and 2023
International Environmental Certification
Blue Flag certification
(Only one in Asia)

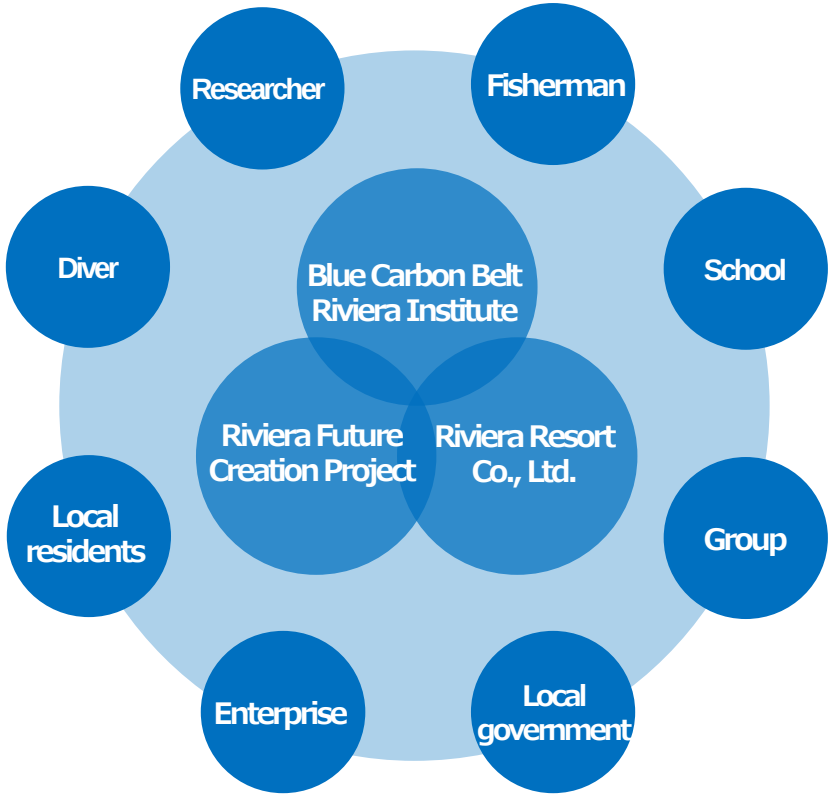
BLUE FLAG

Blue Carbon Belt Riviera Institute to be established in 2022, and seaweed bed restoration in full swing.

About the Blue Carbon Belt Riviera Institute

- The Blue Carbon Belt Riviera Institute, a general incorporated association, advocates a "Blue Carbon Belt®" that links seaweed beds in a belt-like pattern and aims to expand it along the entire coast of Japan.
- The Institute also aims to develop a blue economy by creating a wide regional area along Sagami Bay as a sustainable coastal area full of marine attractions, and to brand the area as "Shonan Blue Carbon®" to create a virtuous cycle for fisheries (fish catch and branded fish).
- Actively conducting eco-tours and disseminating information, and through the LOVE OCEAN project, building connections with the ocean and between people who love the ocean, and promoting the formation of a cyclical model of environmental conservation and regional development.
- As a foothold, the company is taking on the challenge of restoring seaweed beds in its own marinas (Riviera Zushi Marina and Riviera Seabornia Marina) in Kanagawa Prefecture, which are closed areas, a first for a Japanese marina.





Details of initiatives

Riviera Zushi Marina (Zushi City, Kanagawa Prefecture)
November 2022: Early-maturing *Ecklonia cava* installed under the marina pier

As the first step of the “ Blue Carbon Belt® - Shonan Blue Carbon®” project, the Riviera Zushi Marina, the only Blue Flag certified sustainable marina in Asia, is the first marina in Japan to take on the challenge of restoring seaweed beds in the marina.



Riviera Seabornia Marina (Miura City, Kanagawa Prefecture)
March 2023: Early-maturing *Ecklonia cava* installed under the marina pier

As the second phase of the “Blue Carbon Belt® - Shonan Blue Carbon ®” project, we installed early-maturing *Ecklonia cava* under the pier at the Riviera Seabornia Marina. The paddle weed was installed at two locations with different distances from the water surface and different exposure to the sun.



【Underwater photographs of the *Ecklonia cava*】

Late November 2022

Early June 2023

Details of initiatives

[Regular monitoring]

Each month, we regularly monitor the growth of precocious *Ecklonia cava* with experts, researchers, and fishermen, discuss subsequent countermeasures, and monitor progress.

[Tour of seaweed bed restoration site]

In June 2023, two tours of the Riviera Zushi Marina seaweed bed restoration site were held. Divers, who need to work together to build the Blue Carbon Belt®, were given an underwater tour, while other divers, including children, researchers, fishermen, environmental activists, and local government officials, were given a tour from the pier.

[From the Shonan coast to the whole country]

- Accepting students for environmental education at Riviera's activity sites
- LOVE OCEAN" cleanup activities in municipalities without oceans
- Promotion of industry-government-academia collaboration

[Conclusion of the agreement]

Blue Carbon Belt Riviera Institute and Riviera Resort Corporation sign an agreement with Kanagawa Prefecture Kanagawa “Protect the richness of Sagami Bay and realize a decarbonized society" in January 2023.

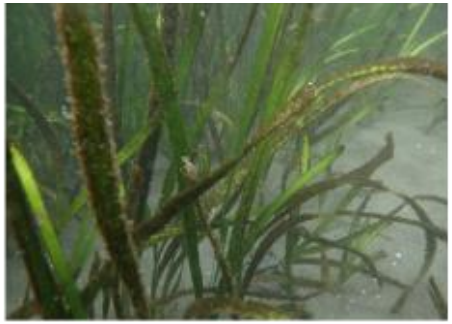
10 Mori Sato Umi Tsunagu Project (Tokyo Gas Co., Ltd.)

Kanto

Restoring eelgrass beds in Tokyo Bay to ensure biodiversity. Strengthening community ties through seaweed bed restoration activities by collecting flowering shoots and planting seeds with employees and their families.

Overview

- With the goal of "restoring the richness of Tokyo Bay," the project aims to restore eelgrass beds in Tokyo Bay, just like planting trees in a forest, to ensure biodiversity and to strengthen our understandings and interests for the ocean through activities.
- Since 2017, the company has been continuously engaged in eelgrass bed restoration activities, with more than 900 employees and their family members participating.
- Strengthening local ties and revitalizing the community through collaboration among businesses, NPOs, citizens, and others involved in eelgrass bed restoration activities



Basic Information

Region	Yokohama City
Participating organizations	Tokyo Gas Co., Ltd. NPO Association for shore Environment Creation
Start year	2017
Contents of activities	• Seeding of seaweeds and transplanting of mother algae • Environmental education and public awareness
Site area	–
Amount of CO2 absorption	–

Eelgrass restoration activities "Mori Sato Umi Tsunagu Project

森里海 つなぐ PROJECT

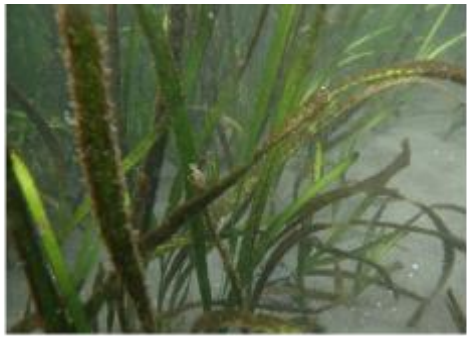
The "Mori Sato Umi Tsunagu Project" is an environmental and social contribution activity of the Tokyo Gas Group.
The **restoration of eelgrass beds** is part of this activity.

The project is being carried out by the Kanto Regional Development Bureau, which is the secretariat of the project.
We are participating in the **"Tokyo Bay UMI Project,"** and working with NPOs, the citizens, and others to restore eelgrass beds

The Tokyo Bay UMI Project aims to "restore the richness to Tokyo Bay" by **restoring eelgrass beds in the Tokyo Bay**, just like planting trees in a forest, **to ensure biodiversity*, and strengthening our understanding and interest for the ocean*** through activities.

Eelgrass restoration activities(Flower branch collection and seed sowing with employees and their families)

Flower branch collection in spring



Eelgrass

Flower branch

Observation of eelgrass bed organisms

Observation of plankton, know as ‘Cradle of the Sea’

Eelgrass seeds planted on clay

Seed sowing in autumn

An underwater drone observation session

Receiving the "Tokyo Bay Marine Environment Restoration Award"

The project received the "Tokyo Bay Marine Environment Restoration Award" in 2019, commended by the Ministry of Land, Infrastructure, Transport and Tourism, for participating in Tokyo Bay environmental research and implementation of environmental awareness activities through eelgrass bed restoration.

The company has been continuously engaged in eelgrass bed restoration activities, with more than 900 employees and their family members participating to date.

Flower branch collection in June

Cleaning up the beaches

Seeds Sowing In November

Offsetting projects with J-Blue Credits

- In March 2021, Tokyo Gas has participated in J-Blue Credit Carbon Offset issued by Japan Blue Economy Technology Research Association, a corporation authorized by the Minister of Land, Infrastructure, Transport and Tourism.
- The J-Blue Credit is a certified blue carbon credit created from the CO2 absorbed by "eelgrass beds" in Yokohama, where the Tokyo Gas Group has also participated in restoration activities. Tokyo Gas has purchased these J-Blue Credits for carbon offsetting.


JBE
Japan Blue Economy association

Jブルークレジット・カーボンオフセット証書

Japan Blue Credit - Carbon Offset Certificate

東京ガス株式会社　殿
Tokyo Gas Co., Ltd.

以下のとおり、カーボンオフセットが実行されたことを確認します。
This is to certify that you carried out carbon offsetting using the following credits.

CO_2 排出量 Emission of CO_2	5.8 t - CO_2
CO_2 償却量 Reduction of CO_2	5.8 t - CO_2

オフセットの対象：東京ガス横浜ショールームの2019年度ガス消費に伴うCO_2排出量の一部
Scope of offsetting: Part of CO_2 emissions from gas consumption in the Tokyo Gas Yokohama showroom in FY2019

クレジットの種類：Jブルークレジット
Type of credit: Japan Blue Credit

プロジェクトの名称：多様な主体が連携した横浜港における藻場づくり活動
Project name: Seagrass and macroalgal beds creation activities at the Port of Yokohama through cooperation among various entities

プロジェクトの種類：炭素除去対策
Type of the project: Carbon removal measures

クレジット発行番号：202101JBCT00001-145 ～ 202101JBCT00001-202
Credit issue number

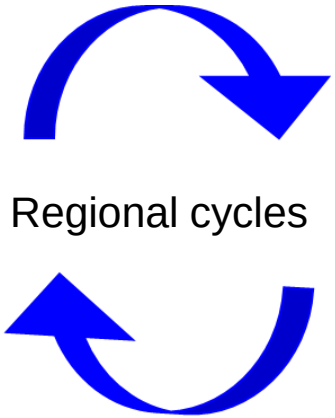
クレジット活用承認年月日：令和３年３月15日
Date of offsetting: March 15, 2021

国土交通大臣認可法人　ジャパンブルーエコノミー技術研究組合　印
Japan Blue Economy association
(The Japanese Ministry of Land, Infrastructure, Transport and Tourism-approved Collaborative Innovation Partnership)

Various Cycles through Eelgrass Beds and Blue Carbon (Carbon Offset)

- In 2021, a portion of CO2 emissions from gas consumption at the Tokyo Gas Yokohama Showroom were offseted in consideration to the local connection of the credits, which are derived from the Port of Yokohama.
  Offseted credit: J-Blue Credit (5.8 t-CO2)
- The project will trigger sustainable regional cycles, including economic cycles, nature cycles, and carbon cycles.
  Economic cycle: Activities themselves are sustainable as money flows to NPOs and other entities involved in the activities.
  Nature cycle: Forests, villages, and oceans are connected through rivers and influence each other.
  Carbon cycle: CO2 emitted through business activities is absorbed by blue carbon (carbon offset).

Location



TOKYOGAS YOKOHAMA SHOWROOM

11 Tokyo Bay UMI Project (Seven-Eleven Foundation , etc.)

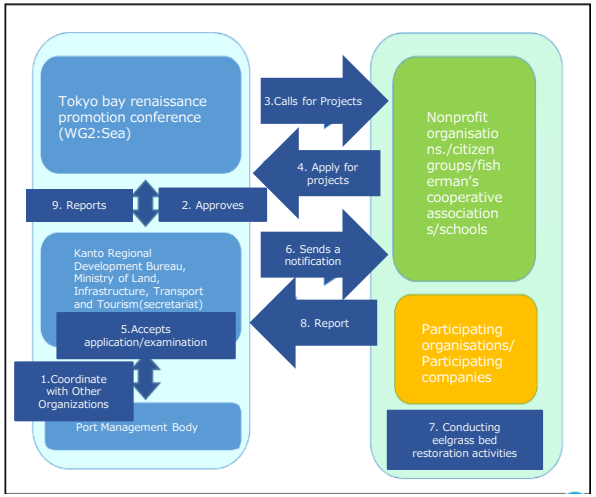
Kanto

Activities to increase eelgrass, which helps purify the water and reduce CO2 emissions, and to restore Tokyo Bay to a rich marine environment.

Overview

- Eight private companies, including the Seven-Eleven Foundation, are participating in the Tokyo Bay UMI Project (organized by the Ministry of Land, Infrastructure, Transport and Tourism) to restore eelgrass beds in Tokyo Bay, and are conducting eelgrass bed restoration activities in the Port of Yokohama,etc.
- In the 16th Tokyo Bay UMI Project activity organized by the Seven-Eleven Foundation (held in May 2023), a total of 283 people gathered at “Umi no Koen” in Kanazawa Ward, Yokohama City, Kanagawa Prefecture, to collect eelgrass flowering shoots, observe eelgrass bed organisms, and clean up the beach.

Role assignment of bodies involved



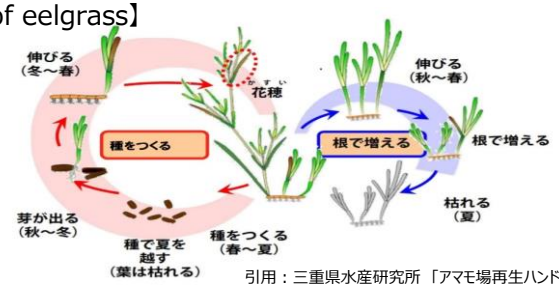
Basic Information

Region	Yokohama City, etc.
Participating organizations	Seven-Eleven Foundation, Toyo Construction Company, Limited, Maruha Nichiro Corporation, Tokyo Gas Co., Ltd., Tokio Marine & Nichido Fire Insurance Co., Ltd., Nippon Television Network Corporation, TOA CORPORATION, Kurita Water Industries Ltd.
Start year	2013
Contents of activities	• Collecting eelgrass flowering shoots, seed selection, seeding of seaweeds, Building an eelgrass nursery and transplanting of mother algae • Environmental education and public awareness • Beach clean-up
Site area	–
Amount of CO2 absorption	–

Tokyo Bay UMI Project

- Towards restoring the richness of Tokyo Bay, the project aims to restore eelgrass beds, known as "cradles of life" in Tokyo Bay, just as trees are planted in a forest, to ensure biodiversity, and to increase understanding and interest in the sea by people through these activities (UMI: '*Umi wo Minna de 'I' suru*' = United for the Love of Tokyo Bay and the Sea).
- Participating organizations (FY2023): Seven-Eleven Foundation, Toyo Construction Company, Limited, Maruha Nichiro Corporation, Tokyo Gas Co., Ltd., Tokio Marine & Nichido Fire Insurance Co., Ltd., Nippon Television Network Corporation, TOA CORPORATION, Kurita Water Industries Ltd.

【Life Cycle of eelgrass】



引用：三重県水産研究所「アマモ場再生ハンドブック」

Collecting flower branches


Participants collecting flower branches


Observation of eelgrass bed organisms


Flower branches


Eelgrass seeds

Sorting seeds


Sorting seeds


Sorting seeds

Creating seedbeds


Creating seedbeds

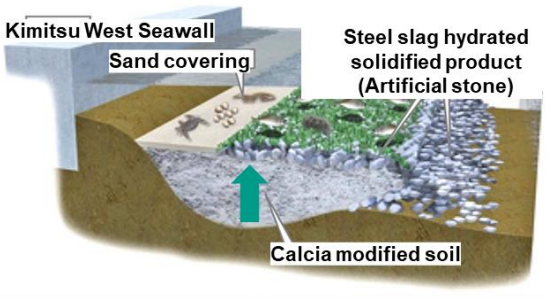
Transplanting Eelgrass

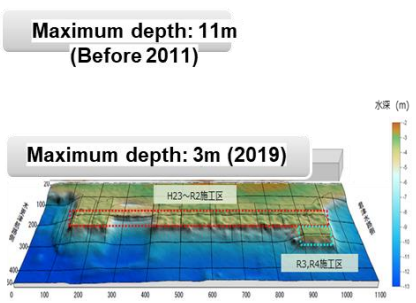
12 Creation of shallow and seagrass beds in front of the Kimitsu West Seawall (Nippon Steel Corporation)

Efforts to improve the marine environment together with the government and fishermen.

Overview

- Challenge: Around 2010, the biological environment of the seafloor changed due to insufficient light caused by the depth of the seafloor depression (-11m) and the retention of hypoxic seawater around the depression.
- Since 2011, the biological environment has been improved by raising the seafloor with improved soil (from -11m to -3m) and by installing artificial stones for seaweed reefs.
- Efforts to improve the marine environment are being made in collaboration with the Chiba Prefecture Federation of Fishery Cooperative Associations and Kimitsu City.





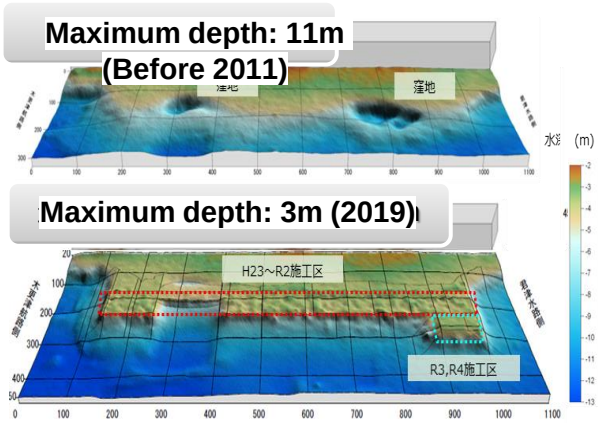
Basic Information

Region	Kimitsu City
Participating organizations	Nippon Steel Corporation, Chiba Prefecture Federation of Fishery Cooperative Associations, Kimitsu City
Start year	2011
Contents of activities	• Installation of rock/block substrate(installation of seaweed bedding material) • Sand covering • Adjustment of water depth
Site area	Approx.12ha (Seaweed bed area,2022)
Amount of CO2 absorption	– ※Currently being calculated

Effects of Improving the Marine Environment by Creating Shallow Areas
～Efforts to improve the marine environment together with the government and fishermen～

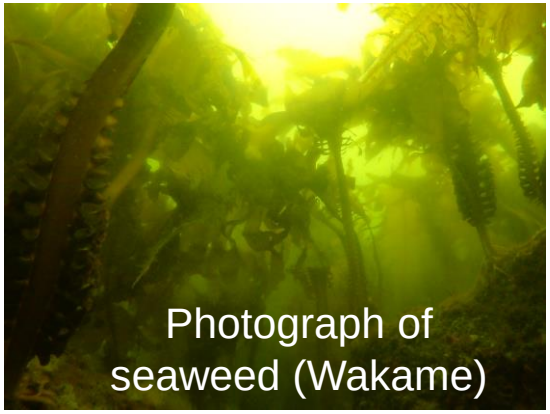
1． Project Overview

Challenge: Around 2010, the biological environment of the seafloor changed due to insufficient light caused by the depth of the seafloor depression (-11m) and the retention of hypoxic seawater around the depression.
Since 2011, the biological environment has been improved by raising the seafloor with improved soil (from -11m to -3m) and by installing artificial stones for seaweed reefs.
Efforts to improve the marine environment are being made in collaboration with the Chiba Prefecture Federation of Fishery Cooperative Associations and Kimitsu City.



2. Main Initiatives and Results (Outstanding Points)

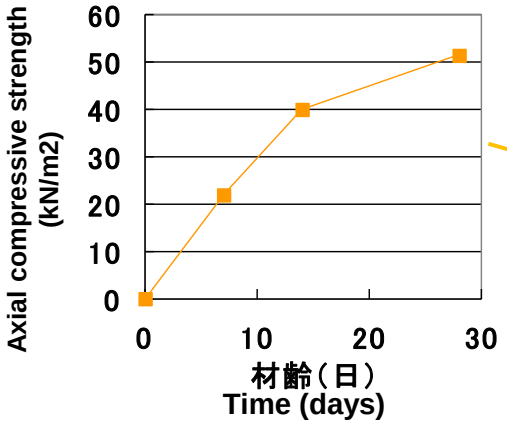
	Details
Improvement of the sea area environment	As of 2022, approx. 12 hectares of seaweed beds will be created to improve the marine environment. ⇒ Shallow water was created to eliminate the stagnation of anoxic seawater. Fish are flocking to the area and seaweed is thriving.
Credit acquisition	In cooperation with Chiba Prefecture Federation of Fishermen's Cooperative Associations and Kimitsu City ⇒ J Blue Credit™ is scheduled to be applied for in 2023.
Societal awareness	Environmental education for junior high school students in Kimitsu City (scheduled for July)



Effects of Improving the Marine Environment by Creating Shallow Areas

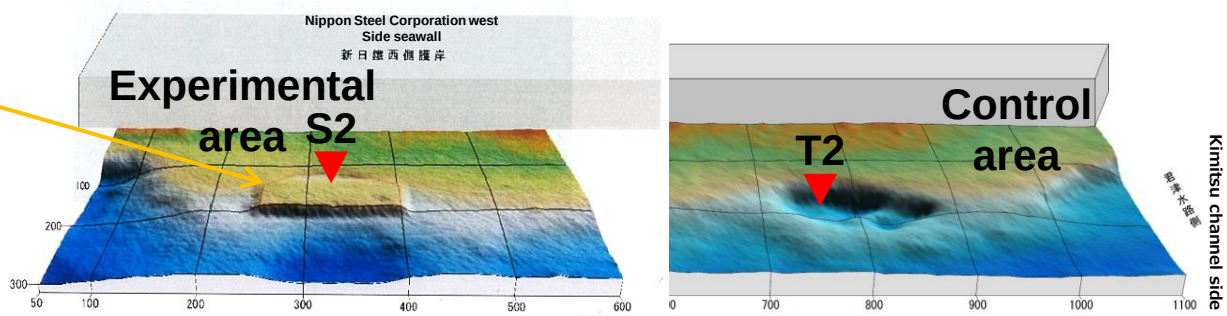
[Stability of shallow structure]

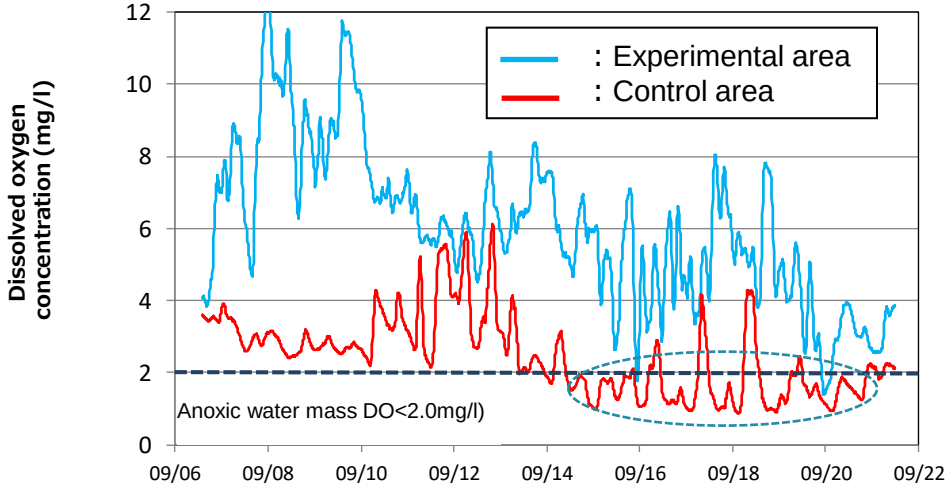
Calcia modified soil: strength development

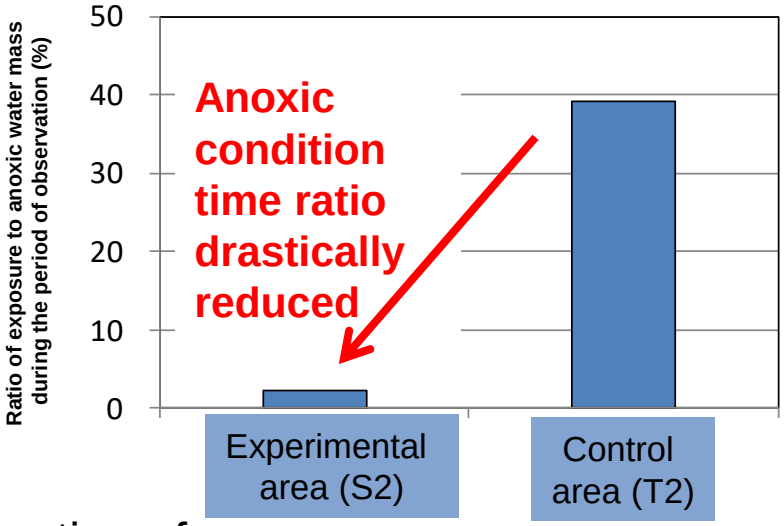


[Preservation of Biological Habitat]

- Focusing on dissolved oxygen concentration as a habitat indicator
- Dissolved oxygen concentrations were continuously measured for 15 days in the experimental (S2) and control (T2) areas.







Topographic stability greatly reduces the retention of anoxic seawater during the summer months

Note: Frequency of occurrence is defined as the frequency of dissolved oxygen falling below 2.0 mg/l during approximately one month of summer observations.

Calcia Modified Soil (dredged soil improvement) and Vivary™ Rock (artificial stone)

Contribution of steel slag products to blue carbon

Propagation material for seaweed that absorbs CO_2

Vivary™ Unit (Fertilizer)

Supplies iron, a component necessary for seaweed growth.

Beverly bags

Beverly box

CO_2-absorbing seaweed substrate material

Steel slag hydrated solidified product (Artificial stone: Vivary™ Rock)

Natural stone substitute

Submerged fill material for raising to depths where light can reach

Calcia modified soil (Geomaterials in water)

Geomaterial that are solidified and improved from dredged soil

Supplies iron

Vivary™ box

Vivary™ bags

Supplies iron

Steel slag hydrate solidified artificial stone（Vivary™ Rock）

Calcia modified soil

Artificial stone

13 Kubisho Coast Satoumi Project (NPO Earth Communication)

Chubu & Hokuriku

Beach cleanup activities aiming to preserve beaches and eelgrass beds.
Environmental education programs held that also included a survey of the organisms that inhabit the eelgrass beds.

Overview

- Beach cleanup activities were held to preserve the eelgrass beds at Omaezaki Port, which has become a dumping ground for marine debris.
- Environmental education programs that also include a species survey in the eelgrass beds, with the aim of "creating opportunities" for people to become interested in nature and the environment, including the ocean.
- Conducting surveys of the coastal environment in collaboration with universities, related organizations, and many others

Basic Information

Region	Omaezaki City,Makinohara City
Participating organizations	Shizuoka Prefecture,NPO Earth Communication
Start year	2017
Contents of activities	• Beach cleanup • Environmental education and public awareness (species survey、environmental study programs)
Site area	–
Amount of CO2 absorption	1.0t-CO_2 (J Blue Credit, FY2022:1.0t-CO2)

Background of the Activity

- In 2017, native and clustered Japanese eelgrass was discovered during maritime operations around the Kubisho Coast located within the Port of Omaezaki.

- It was believed that changes in the coastal environment, such as the construction of a port, had resulted in the formation of a tertiary coastal environment, though originally having been a rocky coast.

- However, various past survey records stated that "seagrass species didn’t exist in Omaezaki," so we consulted with neighboring municipalities such as Omaezaki City, fisheries cooperatives, and other relevant organizations. In 2018, we obtained permission and conducted a unique seabed survey in the vicinity of Kubisho coast. We compiled the survey findings into a report and submitted it to the relevant organizations with whom we had consulted.

- In 2019, we obtained permission to enter the beach several times a year and launched the "Kubisho Coast Satoumi Project" to begin activities.

Current state of the Kubisho beach

[Current Status] (1)

- Access to the beach is restricted
- The beach cannot be seen from the land side
- The beach has become a dumping ground for marine debris
  ⇒ simultaneously accumulating sand ⇒ Tertiary coastal environment is formed.

Entrance of beach

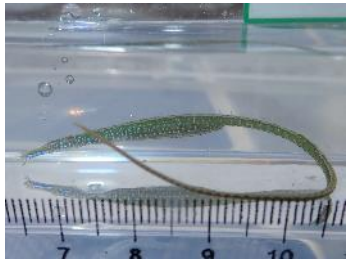
Image of the beach

Trash washed up due to typhoons

[Current Status] (2)

- Dwarf eelgrass and eelgrass growing in the wild in colonies.
- The area of the colonies is about 1.0 *ha* (As of April 2022)
- More than 80 species of sea creatures have been confirmed.
- A tidal flat-like coastal environment has been formed.

Eelgrass bed of Kubisho beach



Pipefish caught in the eelgrass bed

Japanese mud crab inhabiting the Kusao Coast

Initiatives ～ beach cleanup ～

- Since 2019, beach cleanups on the Kubisho coast are organized on an irregular basis.
- Beach cleanups are carried out 3-4 times a month since 2020. At the same time, activity records are compiled to determine the amount of trash that drifts onto the beach.

2020: Total of 50 sessions (total of 50 hours)
Number of participants ... 344 in total
Amount collected ... approx. 24,000 liters, approx. 2,400 kg.

2021: Total of 40 sessions (total of 50 hours)
Number of participants ... 308 in total
Amount collected ... Approx. 16,000 liters, approx. 1,900 kg.

2022: Total 41 sessions (total 45 hours)
Number of participants ... 428 in total
Amount collected ... approx. 18,000 liters, approx. 2,100 kg.

Beach clean event in 2019

Large amount of trash is washed up onshore on a daily basis

Large driftwoods are found every year

Initiatives ～environmental education～

- Since 2019, we have been aiming to "create opportunities" for people to become interested in nature and the environment, including the ocean, as well as learning about the current state of eelgrass and the Kubisho Coast.
- Since 2021, we also hold nighttime observation events of eelgrass beds. Since 2022, we have been conducting year-round observation events of eelgrass beds and other activities, including surveys, with the aim to recognize and understand changes in the coast and eelgrass beds as the seasons change.

  2019: Two sessions, one each in May and June. Total participants: 5
  2020: Cancelled due to the spread of COVID-19.
  2021: Conducted twice, once in June and once in February. Total participants: 50
  2022: Conducted 4 times, once each in May, July, September, and December. Total participants: 84

Observation of living things in the eelgrass beds

Conducting nighttime surveys of creatures in eelgrass beds since 2021

Visit from elementary school students in Omaezaki as classes

Initiatives ～Collaborative Efforts～

Where do the dwarf eelgrass and eelgrass that grow wild and in colonies on the Kubisho coast come from? Why was this coastal environment formed?
We are working to solve these questions with the cooperation of universities and research institutes in Shizuoka Prefecture. We are also involved in beach conservation activities together with local businesses and government agencies.

- Niki Laboratory, Faculty of Oceanography, Tokai University:
  Research on eelgrass beds and coastal environment formation
- Students of the Department of Applied Life Sciences, Faculty of Agriculture, Shizuoka University:
  Genetic survey of eelgrass, acceptance of circle activities
- Research institutions in Shizuoka Prefecture: Microbial survey of eelgrass beds, etc.
- Companies, etc.: Accepting visitors and conducting joint beach cleanups
- Shizuoka Prefecture and the Chubu Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism: Coastal conservation activities, etc.

Photographing the coast using a drone by members of Niki Laboratory of Tokai University, School of Marine Science and Technology

Eelgrass sampling by students at Department of Applied Life Sciences, Faculty of Agriculture, Shizuoka University

Seawater sampling of eelgrass beds by research institutes

Coastal conservation activities with the members of Council for Safety of Omaezaki Port Construction

Raising awareness through initiatives and the future activities

[Initiatives implemented so far]

- Certified as J Blue Credit (1.0t-CO2)
- Toward a valuable and important beach in Omaezaki
- Certified as a "Shizuoka Port Supporter" and designated as a "Port Cooperation Organization”

<u>The beach had been forgotten by everyone, but with the changes in society, it has once again become a beach recognized by many.</u>

Efforts featured as front-page news by Shizuoka Shimbun

Certified as J Blue Credit

Handover Ceremony of the proposal for Omaezaki Port

[The Future]

- Shizuoka Prefecture's Leading “Seaside Environmental Learning Field”
- Registered as an OECM (area contributing to biodiversity conservation outside of protected areas)
- Further research and study will lead to better conservation activities

We will continue to engage in activities to achieve the above three goals.

14 Atami Blue Carbon Project (Miraisozobu / dba For Future Company)

Chubu & Hokuriku

Establishing 'Blue Carbon Project Promotion Council' to promote eelgrass bed restoration activities in collaboration with local stakeholders.

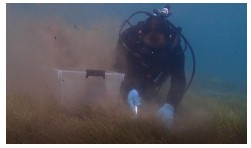
Overview

- Establishment of the Blue Carbon Project Promotion Council and promotion of dwarf eelgrass restoration activities in Atami City in cooperation with local stakeholders and the media
- Developing a simple and inexpensive seagrass meadows distribution survey methods, such as ROV (underwater drone), GPS fish detector, underwater camera, etc.
- Establishment and operation of the Japan Blue Carbon Network, a non-profit organization, to link domestic and international blue carbon initiatives, as well as sharing and deploying information and knowledge.

1． Restoration of seagrass meadows
Development of methods for surveying eelgrass beds distribution (field survey, case study)

2． Survey of seagrass meadows
Development of methods

3． Sharing and deploying information and knowledge
Connecting blue carbon initiatives around Japan



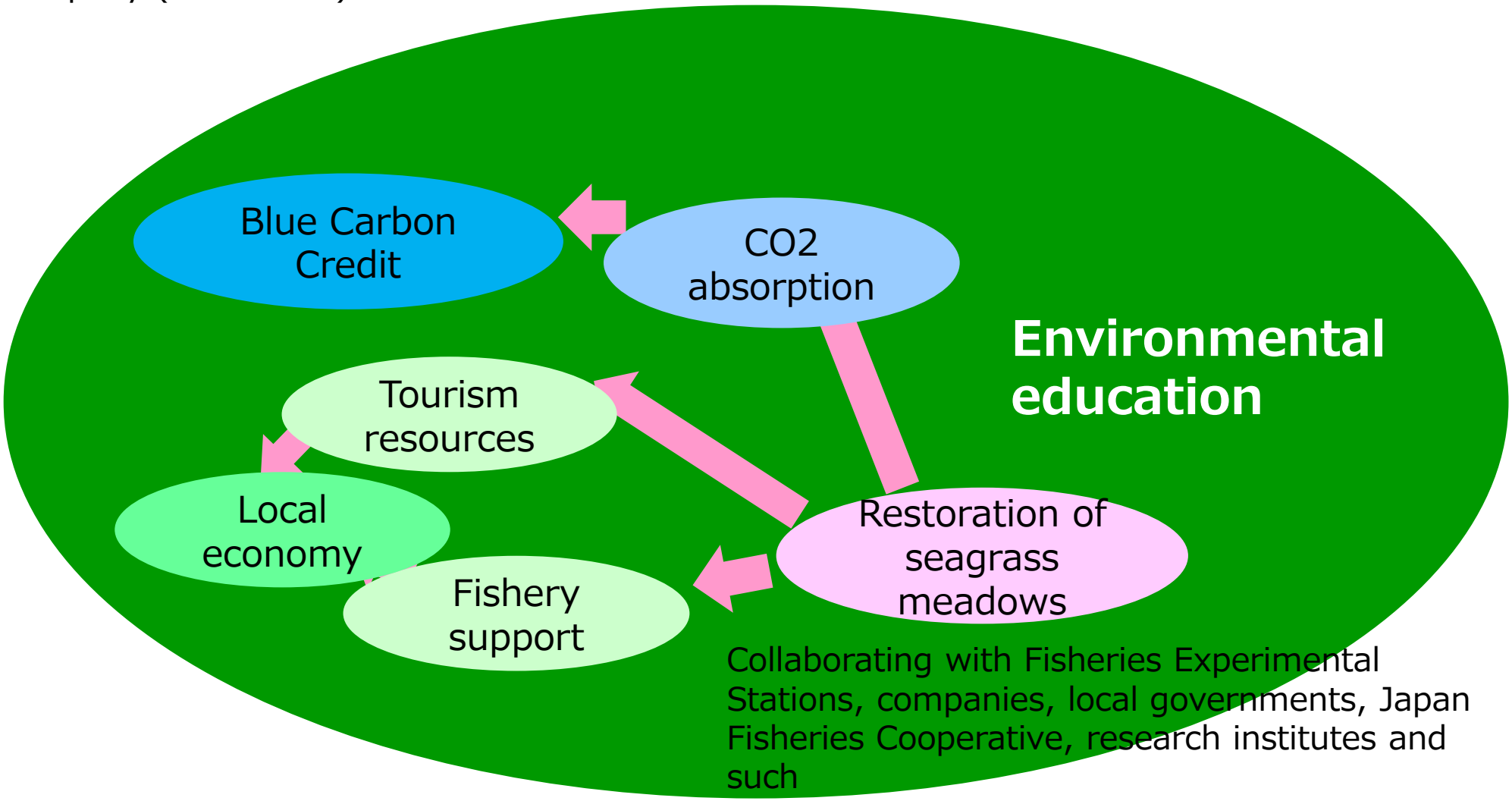
Basic Information

Region	Atami City
Participating organizations	Atami City, Marine Open Innovation Institute, Aoki Construction Corp., Atami Marine Service Co., Green Guardian Co., e's Inc., Miraisozobu / dba For Future Company (secretariat)
Start year	2021
Contents of activities	• Seeding of seagrasses and transplanting of mother algae • Technology development (Survey of seagrass meadows) • Environmental education and public awareness(Establishment and operation of the Japan Blue Carbon Network)
Site area	–
Amount of CO2 absorption	–

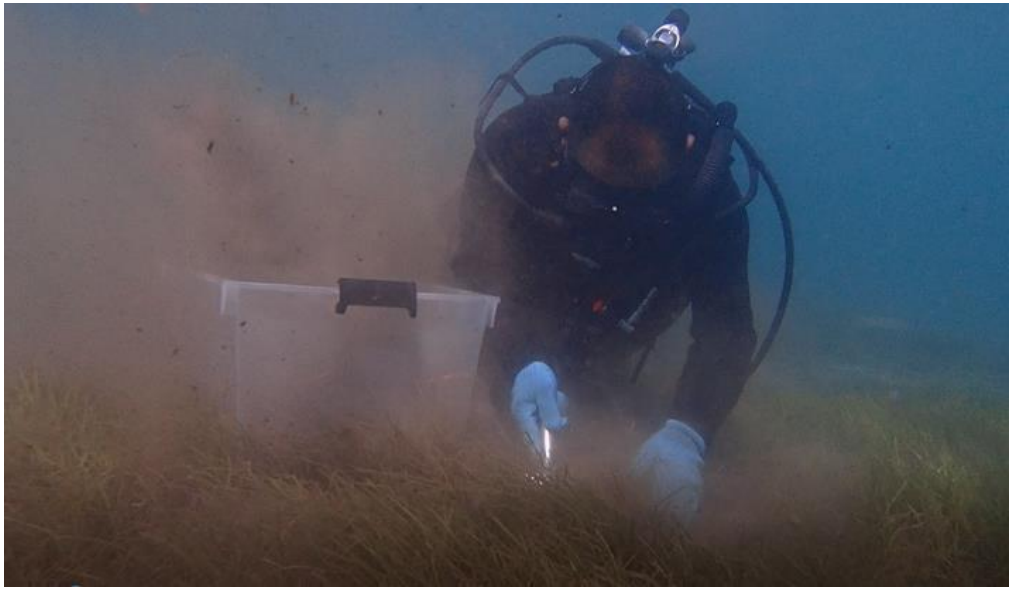
Restoration of seagrass meadows
Blue Carbon Atami Model Climate change x Fishery x Tourism x Environmental education

Establishment of the Blue Carbon Project Promotion Council and promotion of dwarf eelgrass restoration activities in Atami City in cooperation with local stakeholders and the media.

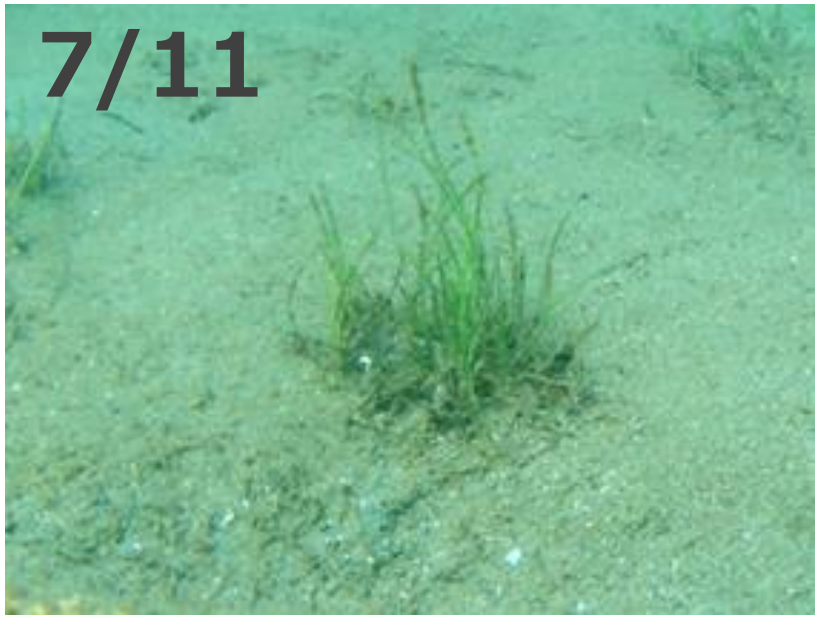
Participating organizations : Atami City, Marine Open Innovation Institute, Aoki Construction Corp., Atami Marine Service Co., Green Guardian Co., e's Inc., Miraisozobu / dba For Future Company (secretariat)

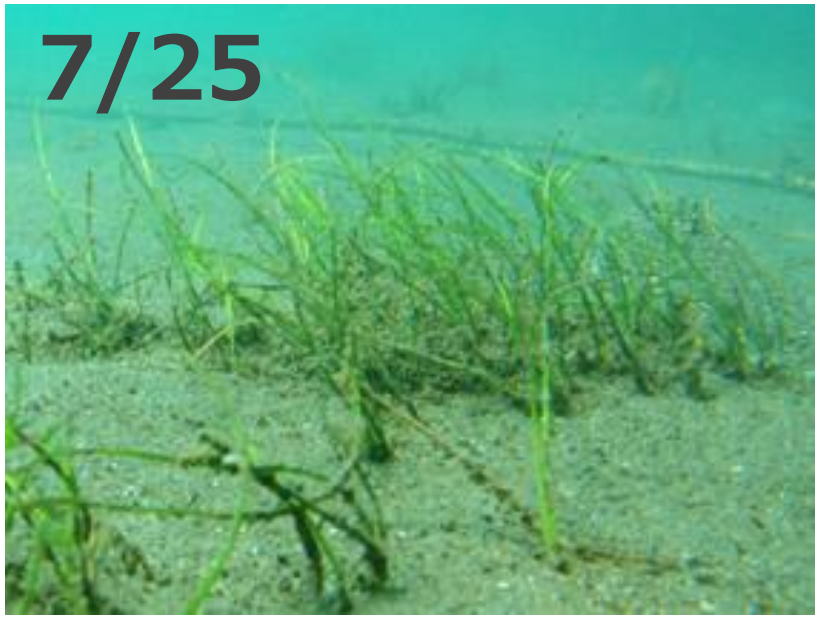


①Restoration of seagrass meadows
Photographs of transplanting mother algae(dwarf eelgrass)



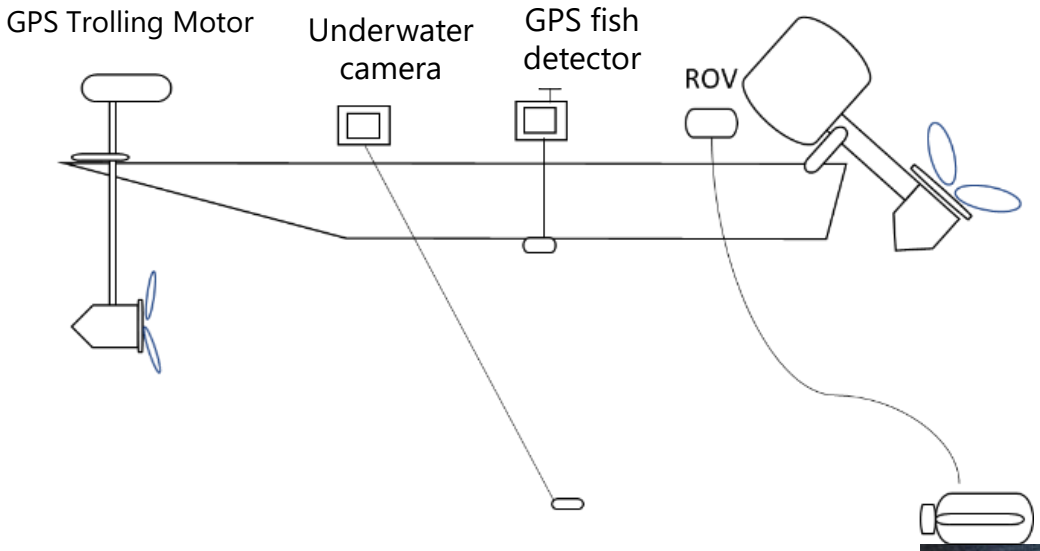
①Restoration of seagrass meadows
Photographs of transplanting mother algae(dwarf eelgrass)

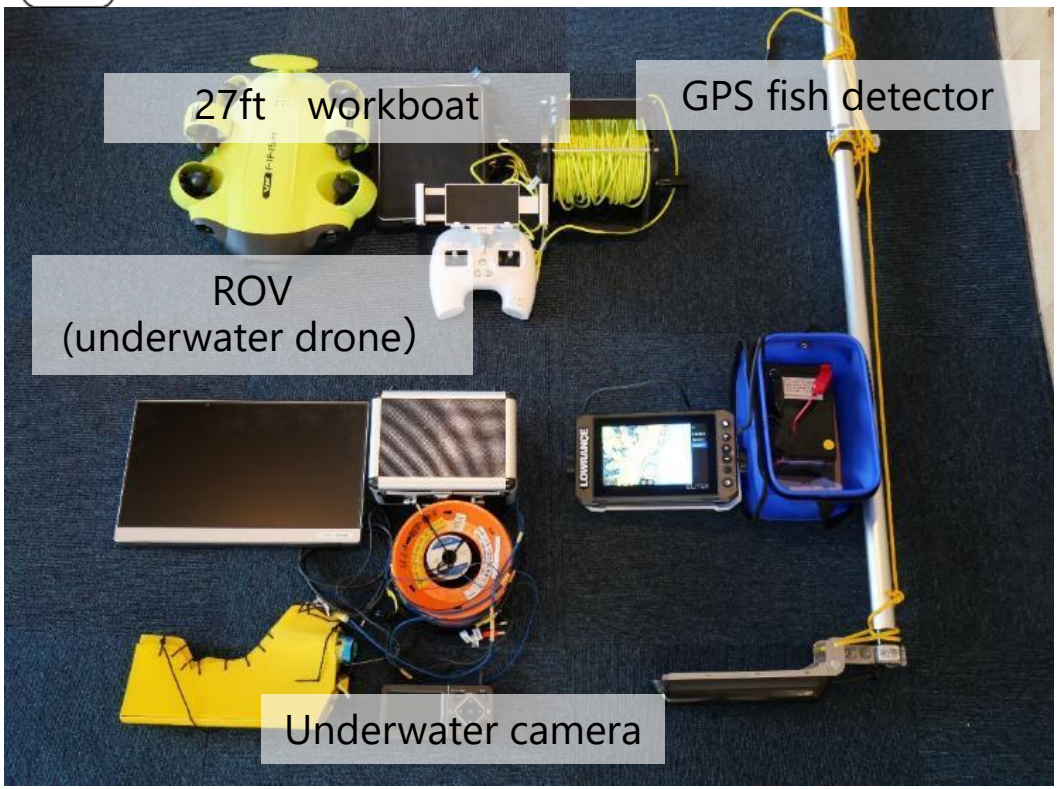




② Survey of seagrass meadows

Development of simple and inexpensive methods for surveying seagrass meadows distribution





③Sharing and deploying information and knowledge
Establishment and operation of the Japan Blue Carbon Network

Connecting blue carbon initiatives around Japan as well as sharing and deploying information and knowledge
Organizing seminars and tours
Developing and collaborating with companies and research institutes
(30 supporting companies and 72 individual supporters as of October 31, 2023)

15 Project to Restore Seaweed beds in the Hainan Area, Shizuoka Prefecture (Hainan Area Isoyake Countermeasures Promotion Council)

Chubu & Hokuriku

Organizing the 'Council for the Promotion of Measures to Combat Isoyake' and launching projects to restore seaweed beds that had been lost due to the isoyake.

Overview

- The sea grass beds in the Hainan area used to be one of the largest in Japan, but they disappeared due to isoyake in the early 1990s.
- In 1996, the Minami Suruga Bay Fisheries Cooperative Association (starting out as five Hainan fisheries cooperatives) along with related cities and towns organized the Hainan Area Isoyake Countermeasures Promotion Council and launched projects to restore seagrass beds.
- In 2009, the Hainan Council for Isoyake Countermeasures joined the project, and implemented the introduction of sporophyte, transplantation of seedlings, monitoring of the recovery of the seaweed beds, and removal of algae-eating fish. etc.


Implemented the introduction of sporophyte


Transplantation of seedlings


Divers transplant seedlings


Recovery of the seaweed beds

Hainan Area,Shizuoka Prefecture

Basic Information

Region	Omaezaki City,Makinohara City,Yoshida Town
Participating organizations	Hainan Area Isoyake Countermeasures Promotion Council, Minami Suruga Bay Fisheries Cooperative Association
Start year	1996
Contents of activities	• Seeding of seaweeds and transplanting of mother algae • Removal of herbivore (algae-eating fish)
Site area	–
Amount of CO2 absorption	49.1 t-CO2 (J Blue Credit, FY2021:49.1t-CO2)

History of Isoyake Countermeasures by the Prefecture and Fisheries Cooperative Associations

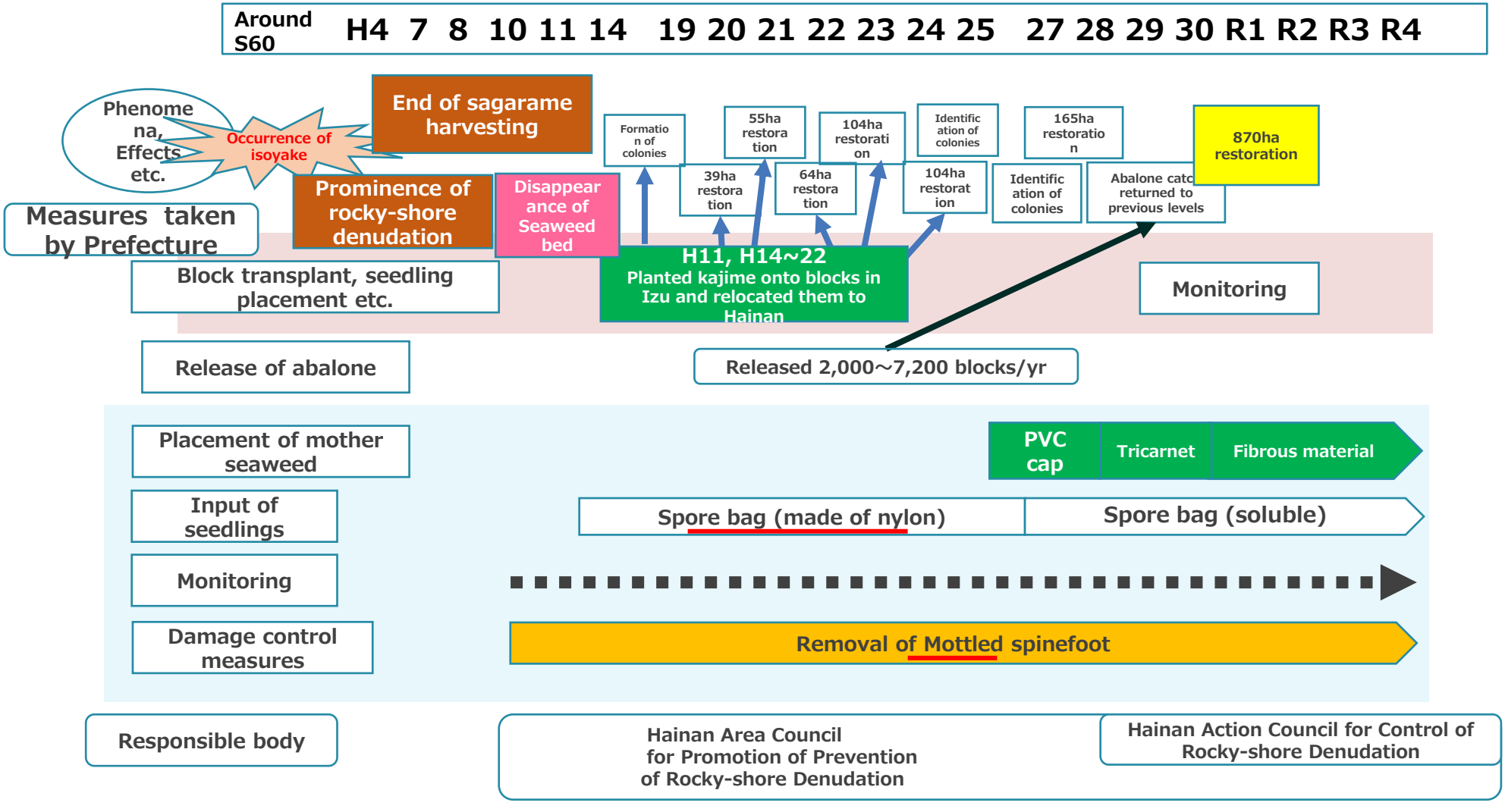
Countermeasures have been implemented since around 1995, when isoyake became so pronounced that sagarame (*Eisenia arborea*) harvesting became impossible.

Details of the project:

(1) Increasing seaweeds by directly planting kajime(*Ecklonia cava*) and sagarame (*Eisenia arborea*) etc.

(2) Reducing feeding damage (e.g., by capturing black mottled spinefoot)

(3) Increase the number of species to be caught (e.g., by releasing abalones)



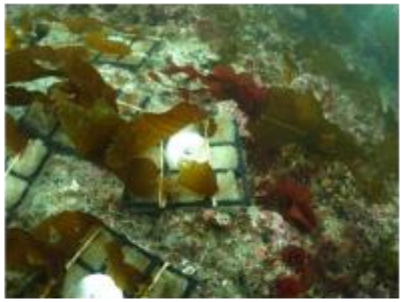
Planting sporophyte

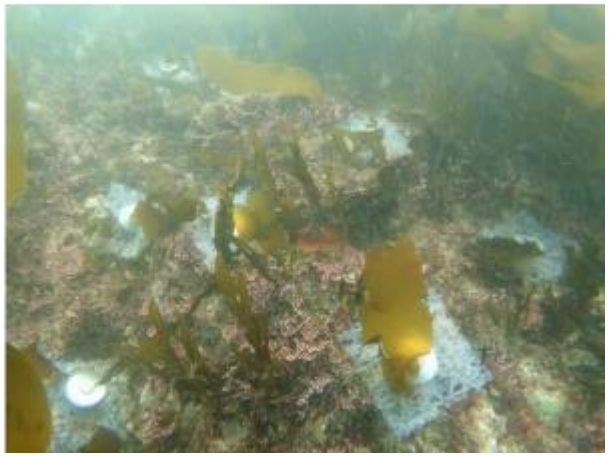
Sporophyte can be planted by attaching larvae of sargassum to the transplanting base and placing them in the sea.

PVC cap
(Plastic)

Tricarnet
(Plastic)

Fibrous material
(biodegradable plastic)

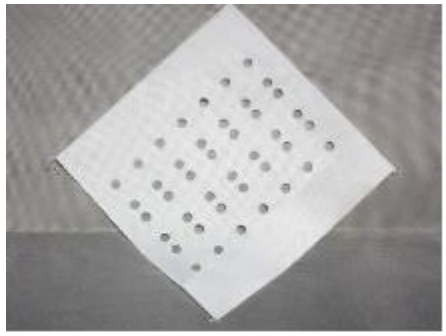




Sea palms are cultured using deep sea water at the Fisheries and Ocean Technology Research Institute

Throwing seeds into the sea

Biodegradable spore bags



Providing seeds using biodegradable spore bags

Reducing feeding damage

- Mottled spinefoot and Scalpel sawtail bycatch in fixed nets. The captured prey species are eaten.

Mottled spinefoot

Scalpel sawtail

Monitoring

- Observe the seaweed bed conditions and abalones by diving. Fishermen dive in pairs to take photos and videos to observe the coverage of the seaweed beds.

Image of monitoring

Image of abalone

Images from the monitoring research, 2022/04/22

'Ashitakaiwa' rocks
(Makinohara City)

Submerged breakwater
at Sakai-Hirata Port
(Makinohara City)

Releasing juvenile abalone
into restoring seaweed beds
(around Sakai-Hirata Port ,Makinohara City)

16 Activities of NPO SEA-MO in Kumano-nada, Mie Prefecture (NPO SEA-MO)

Chubu & Hokuriku

Establishing a NPO to maintain and expand seaweed beds by conducting activities to exterminate herbivore.
In order to restore seaweed beds in cooperation with divers, student divers, fishery cooperatives, local governments, and research institutions.

Overview

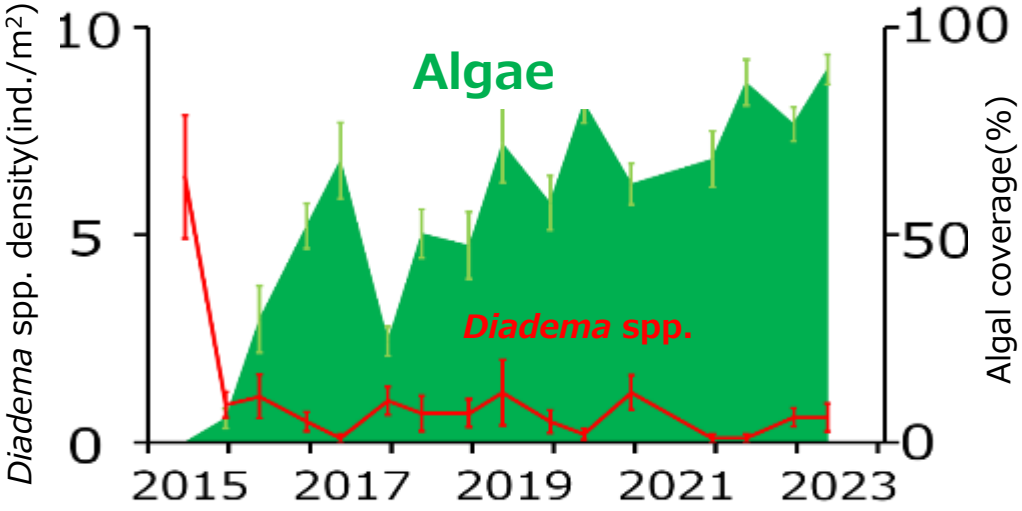
- Continuous extermination activities in Kumano-nada, Mie Prefecture, using a method reported (Kurashima et al., 2014) to increase seaweeds by exterminating sea urchins (*Diadema* spp.).
- The chairmen who own dive shop have established NPO SEA-MO, to have divers and student divers conduct extermination activities to solve the shortage of manpower due to the aging and decrease in the number of fishermen who conduct extermination activities.
- Aiming to restore seaweed beds in cooperation with local fishery cooperatives, local governments, and research institutions.

Basic Information

Region	Mie Prefecture
Participating organizations	NPO SEA-MO, Miegaiwan Fishery Cooperative Association, Minamiise Town, Kihoku Town, Laboratory of Phycology of Mie University, Toba Fisheries Science Center
Start year	2015
Contents of activities	・Removal of herbivore (sea urchins) ・Seeding and transplantation of seaweeds
Site area	26.1ha Total area of restored seaweed bed, certified by J Blue Credit
Amount of CO2 absorption	28.9t-CO2 (J Blue Credit, FY2022 : 28.9t-CO2)

Example of NPO SEA-MO's Activities in Kumano-nada, Mie Prefecture

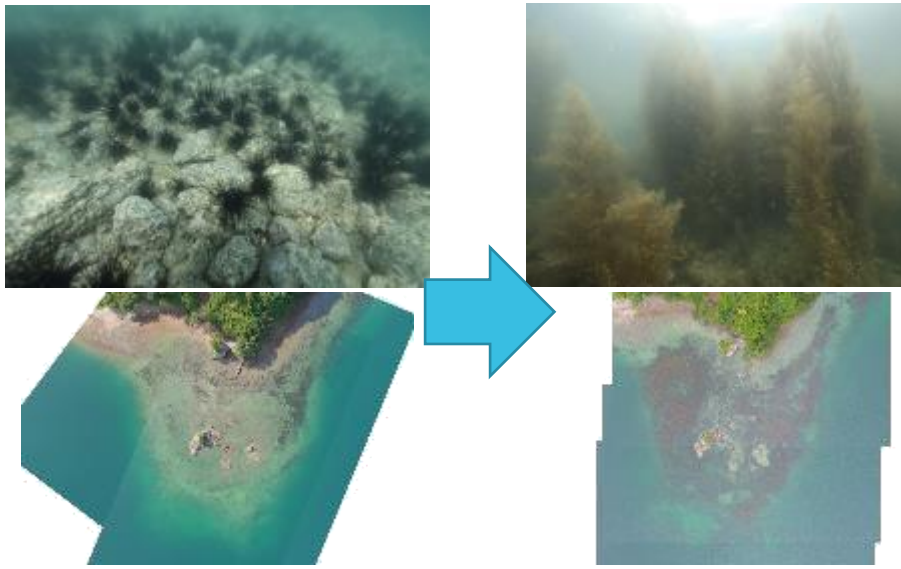
- In the southern part of Mie Prefecture, surveys conducted from the late 1990s to 2000 confirmed the occurrence of isoyake (barren ground) and pointed to feeding damage by herbivores such as *Heliocidaris crassispinaurple* and *Diadema* spp. as a factor.
- Research conducted in the same area showed that seaweeds can grow by exterminating *Diadema* spp. and keeping their density at 2 individuals/m^2 or less.
- The most efficient method of extermination is reported to be removal by SCUBA diving.



Photographed on Oct. 9, 2021. Shuku-ura

Photographed on Jul. 15, 2018, Shiro-ura

SCUBA divers crush and destroy the *Diadema* spp. with a stainless-steel rod to exterminate them. This is considered to be the most efficient extermination method.



Photographed on Jun. 27, 2022 (before extermination)

Photographed on May 26, 2023 (after extermination)

Hikimoto-ura, Kitamuro-gun, Kihoku Town, Mie Prefecture
Adjacent to Shiro-ura, the target of the J Blue Credit Project, the growth environment of seaweed beds similar to that of Shiro-ura and Shuku-ura.
This is an area where *Diadema* spp. extermination has not been conducted until 2022, and isoyake, which is believed to be caused by *Diadema* spp. , was observed over a wide area.
From 2022, SEA-MO conducted the same activities as the project and took climate change countermeasures (restoration and maintenance of seaweed beds), resulting in the recovery of seaweed beds.

Background of the establishment of NPO SEA-MO

- The chairmen operate a dive shop and are also engaged in diving researches related to seaweed bed creation.
- As SCUBA diving instructors, they were considering ways to lower diving fees in the hope that licensed divers (especially university students whom they instruct) would keep diving for a long time.
- After witnessing the decline of seaweed beds during a SCUBA diving survey, they decided to make efforts to preserve the marine environment and leave an ocean that is highly diverse and enjoyable for future divers.

Apr. 23, 2015, Shiro-ura
Briefing Session concerning the NPO activity for local fishermen
Professor Miyuki Maegawa of Mie University (at the time) explained the importance of the activity and asked for approvals.

- In some areas, fishermen exterminate sea urchins from boats or by skin diving, but the aging and decreasing number of fishermen has resulted in a lack of human resources.
- Above all, it is difficult for fishermen to exterminate sea urchins by SCUBA diving.

Sea藻

Establishing SEA-MO as a NPO and working to solve problems.

[Specific content of activities]
- Using the method of Kurashima et al. 2014, we conduct continuous extermination activities to maintain and expand seaweed beds in the isoyake area in the southern part of Mie Prefecture.
- In addition to the sargassum beds, we aim to restore *Eisenia* and *Ecklonia* beds in areas where they can grow.

Overview of the Activities to Maintain and Expand Seaweed Beds

- *Diadema* spp. extermination activities started in 2015 in two areas (Shuku-ura, Minamiise Town and Shiro-ura, Kihoku Town) in Kumano-nada, Mie Prefecture.
- NPO SEA-MO took leadership to conduct this activity in cooperation with Miegaiwan Fisheries Cooperative Association, Minamiise Town, Kihoku Town, Laboratory of Phycology of Mie University and Toba Fisheries Science Center.
- Many divers from, Mie University Diving Club members, Aichi Prefectural Miya Fisheries High School students, and other volunteer divers participated in the extermination activities.

Details of implementation (extermination activities)

Several fishermen are in charge of operating the boat and managing safety during the boarding process.
Several SEA-MO staff members are responsible for transporting volunteers to the site and for safety management during the extermination.
Around 15 volunteers dive with SEA-MO staff members to exterminate *Diadema* spp.by SCUBA diving.

Roles of involved parties

NPO SEA-MO
Conducting activities as the main body
Duty : Monitoring, Data compiling
Volunteer recruitment, Drop-off at the activity site, Managing the safety of participants in the water during extermination, Arrangement for diving equipment, general office work

(Volunteers)
Participation in extermination activities

Miegaiwan Fishery Cooperative Association
Duty : Provision of information on locations suffering from isoyake, Ship chartering during activities, Safety management

Minamiise Town, Kihoku Town
Duty : Provision of facilities, Historical survey data & current information

Toba Fisheries Science Center
Duty : Provision of seedlings and various information

Laboratory of Phycology of Mie University
Duty : Instruction and advice on monitoring methods, evaluation methods, etc.

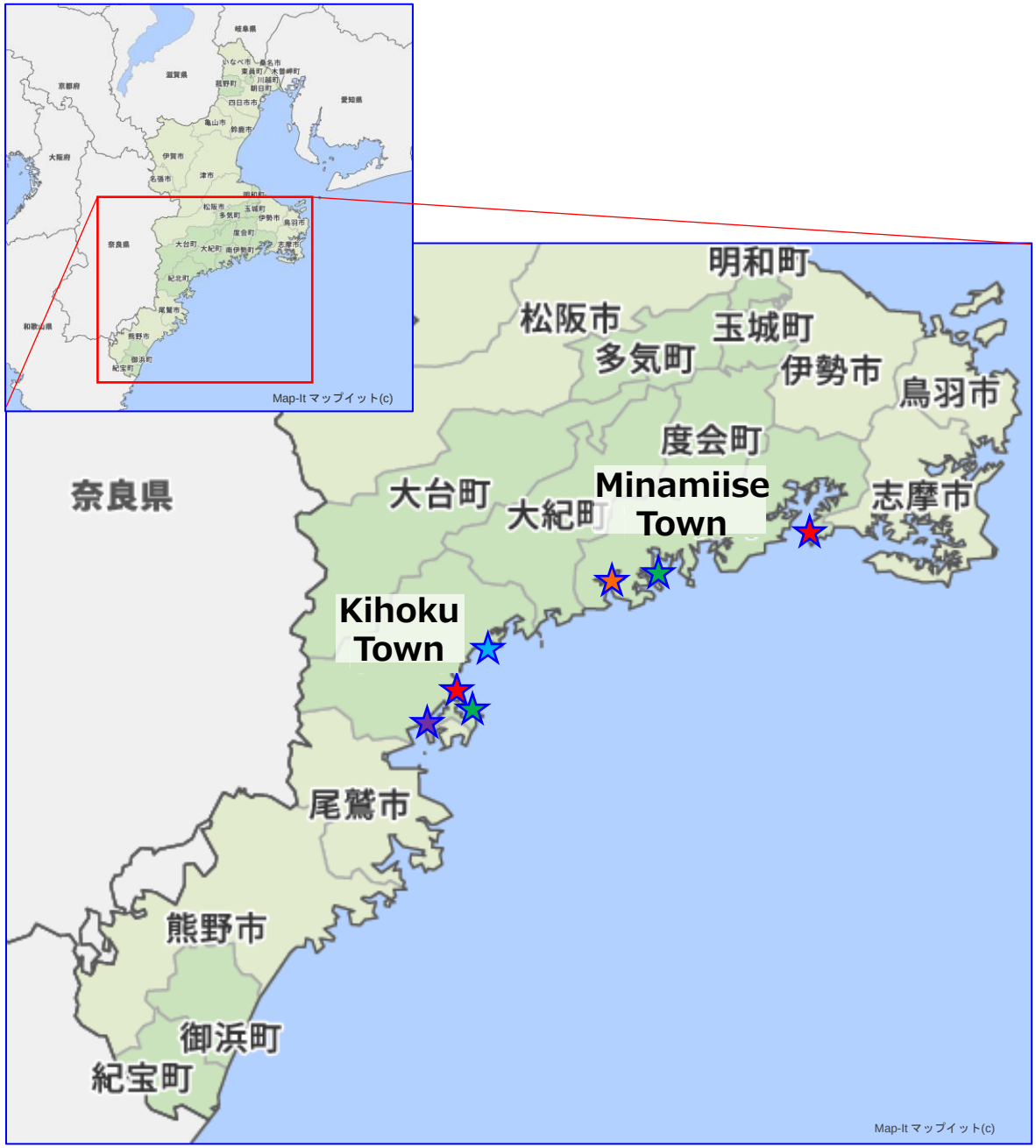
About J Blue Credits

We had realized the expansion of seaweed beds due to our activities in 2022, so we have applied for J Blue Credits for the activities of the past 5 years, which were certified and issued.

	Period	Shuku-ura			Shiro-ura		
		Activity	Area of restored seaweed bed (ha)	Blue Carbon amount (t-CO2/yr)	Activity	Area of restored seaweed bed (ha)	Blue Carbon amount (t-CO2/yr)
2017	2017/5/21 ～ 2018/5/18	Extermination of sea urchins, placement of sporophyte （placed species : *Eisenia, Ecklonia*）	0.81	0.68	Extermination of sea urchins, placement of sporophyte （placed species : *Eisenia, Ecklonia*）, installation of anti-intrusion netting	2.03	1.26
2018	2018/5/19 ～ 2019/5/18	Extermination of sea urchins, placement of sporophyte （placed species : *Sargassum fusiforme*）	2.05	2.05	Extermination of sea urchins, placement of sporophyte, input of seaweed seedling （placed species : *Eisenia, Ecklonia*）	2.03	1.93
2019	2019/5/19 ～ 2020/5/18	Extermination of sea urchins	2.83	2.83	Extermination of sea urchins, input of seaweed seedling （placed species : *Eisenia, Ecklonia*）	1.98	1.99
2020	2020/5/23 ～ 2021/5/22	Extermination of sea urchins	3.31	3.96	Extermination of sea urchins	2.45	3.16
2021	2021/5/29 ～ 2022/5/28	Extermination of sea urchins	5.48	7.79	Extermination of sea urchins, input of seaweed seedling （placed species : *Eisenia, Ecklonia*）	2.45	3.34
Total (rounded down to the 1st decimal place)			15.2	17.3		10.9	11.6
		Area of restored seaweed bed （ha） : 26.1 Blue Carbon amount （t-CO2/yr） : 28.9					

J Blue credits are transferred (sold) so that the profits can be used to fund SEA-MO's activities

Other Regional Initiatives



[Areas where extermination was implemented]

2015 - Shuku-ura, Minamiise Town, Shiro-ura, Kihoku Town

2016 - Kowa-ura, Minamiise Town

2018 - Kamisaki-ura, Minamiise Town, Shimakatsu-ura, Kihoku Town
2019 - Kaino, Kihoku Town

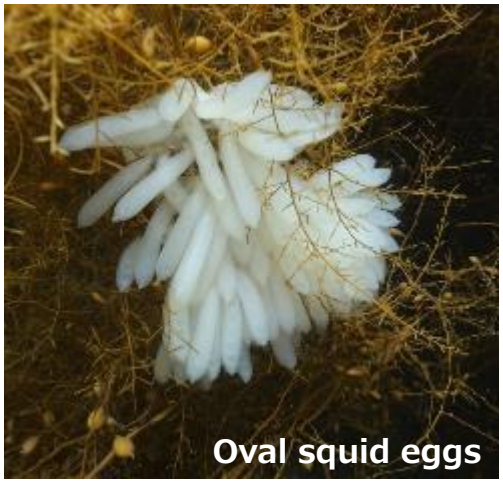
2022 - Hikimoto-ura, Kihoku Town

- Activities began at 2 sites in 2015, 7 sites by 2022
- Number of Sea urchins (*Diadema* spp.) exterminated in 8 years from 2015 to 2022: 1,236,661

- Some people assumed that divers are poachers, so we worked to build a relationship of trust with fishermen in our activities by communicating our results from the activity.
- As a result, even divers have come to be accepted by the fishermen.
- Thanks to a better understanding of our activities, we have been able to further expand our activities.

Results of Activities and Future Challenges


Restored seaweed bed


Oval squid eggs


Spiny lobster eating *Diadema* spp.


Sea bream eating *Diadema* spp.

- Many oval squid eggs were attached to the restored seaweed, while lobsters and sea breams were seen feeding on the exterminated *Diadema* spp. during the sea urchin extermination activities.
- In areas where seaweed beds have been restored, the number of spiny lobsters, abalone, and hijiki (*Sargassum fusiforme*) was significantly higher than in adjacent isoyake areas, indicating that the environment of fishing ground has improved.


Photographed on May. 28, 2022 Shiro-ura


Photographed on Dec. 17, 2022, Shiro-ura

<u>*Lack of funds is the biggest challenge that NPO SEA-MO is facing.</u>

- In the past, grants have been the main source of funding for activities.
- There is no stable source of funds because of the lack of applicable funds.
- We aim to secure continuous funding through certification/issuance and transfer (sale) of J Blue Credits.

17 Sea Cradle Restoration Activities (Hannan City)

Kansai

Promoting marine education for the next generation, promoting blue economy through natural regeneration activities(e.g. eelgrass restoration), and visualizing CO2 reductions to increase motivation for learning.

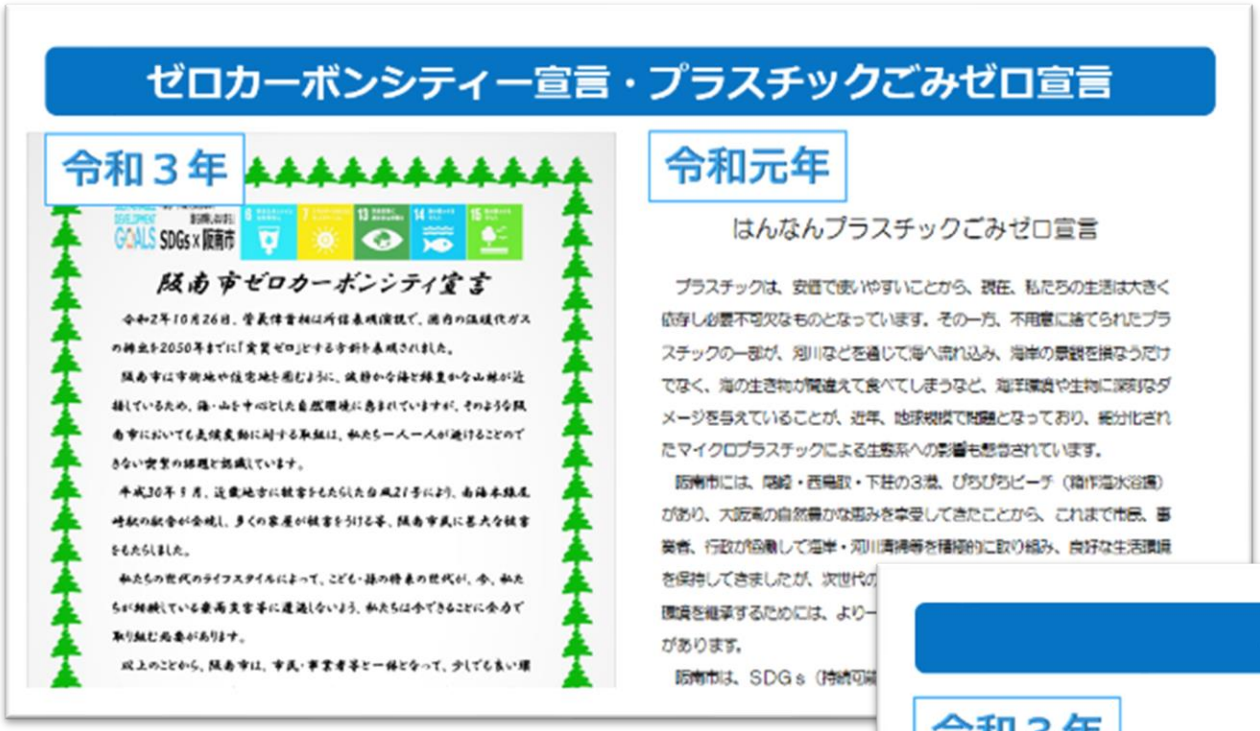
Overview

- Promoting marine education at elementary schools in Hannan City to cultivate the next generation and to foster an interest in the sea in the local community, particularly in Osaka Bay and the seas across the country, in order to realize a sustainable Osaka Bay.
- Since 2006, various entities such as the government, fishery cooperatives, NPOs, and citizens have collaborated to support elementary schools, resulting in the conservation of approximately 2 hectares of eelgrass beds by the participation of activities by children.
- Visualizing activities in terms of CO2 emissions reductions aims to improve children's motivation to learn.

Basic Information

Region	Hannan City
Participating organizations	Fishermen Company,Limited,、NPO Institute of Environmental Restoration/Creation on Osaka Bay Coastal Zone, Hannan City, Hannan City Board of Education, Elementary schools in Hannan City, Ozaki Fishing Cooperative Association, Nishi-tottori Fishery Association, Shimosyo Fisheries Cooperative Association,TEAM☆GASA
Start year	2006
Contents of activities	• Seeding of seaweeds and transplanting of sporophyte Environmental education and public awareness
Site area	–
Amount of CO2 absorption	3.4t-CO2 (J Blue Credit, FY2022:3.4t-CO2)

To be passed on to the children of the next generation



- Our commitment to take every possible action at present to hand down an even more improved environment to the forthcoming generations of children and grandchildren by embracing the lifestyle choices of our own generation.

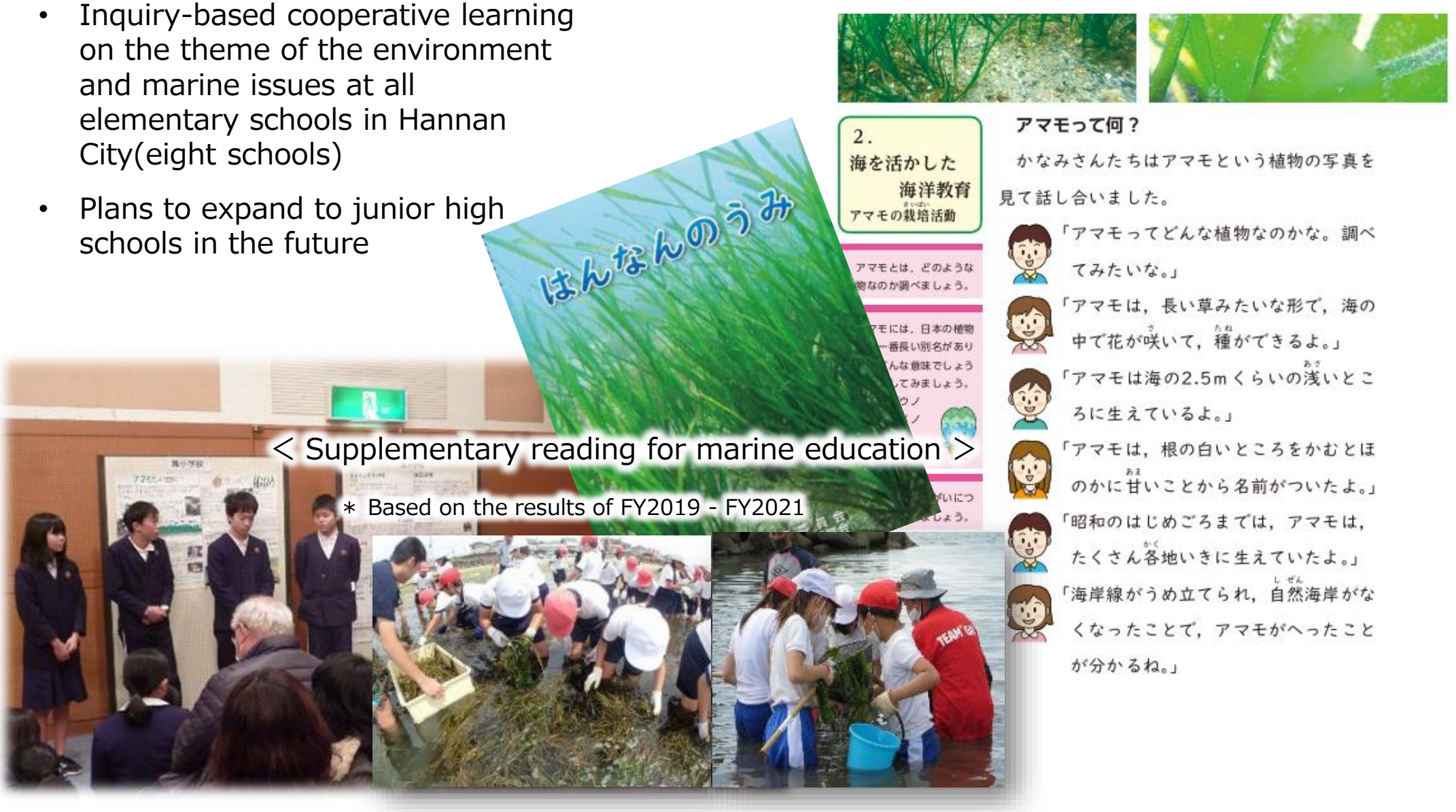
- 30by30 target = goal to conserve 30% of land and sea by 2030
- Sites that contribute to biodiversity conservation outside of protected areas are certified as “OECM” nature symbiosis sites by the Ministry of the Environment (Hannan Seven Sea Forest
- was certified in October 2023).

A town with a rich ocean and the people who support it

“Activities to protect the sea” What can we do?

Marine Education Pioneer Schools Program

- Inquiry-based cooperative learning on the theme of the environment and marine issues at all elementary schools in Hannan City(eight schools)
- Plans to expand to junior high schools in the future

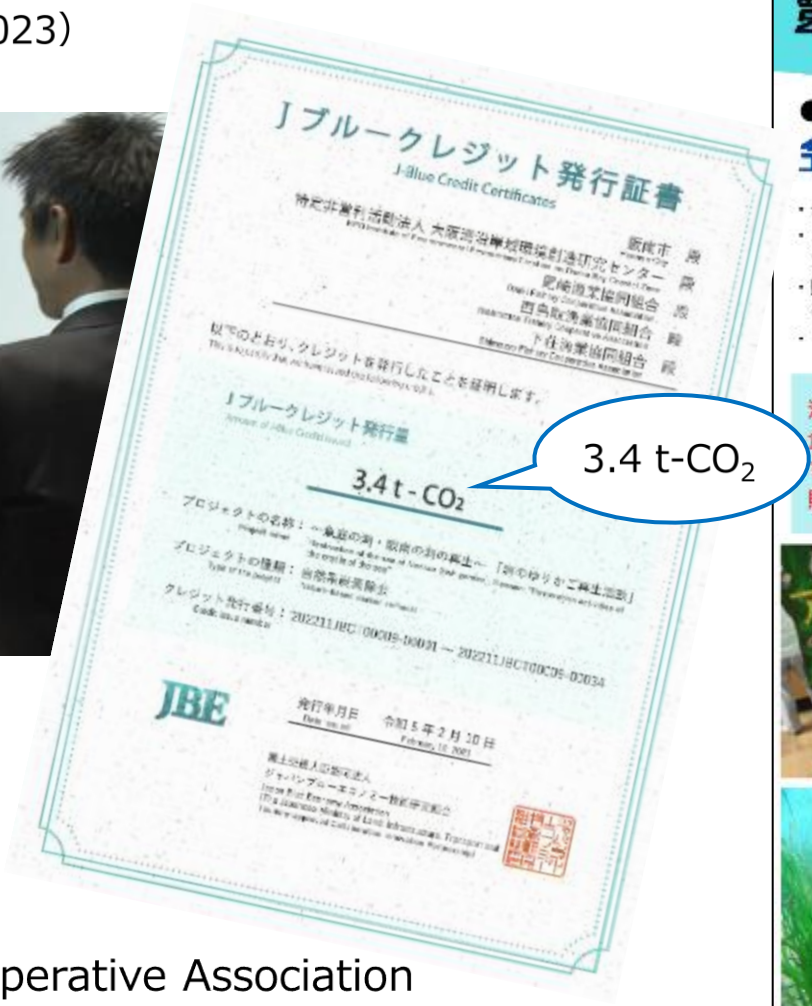


＜ Supplementary reading for marine education ＞

＊ Based on the results of FY2019 - FY2021

As an Ongoing Support for Children's Activities

J Blue Credit
Ceremony for issuance of certificates
（10 February 2023）



3.4 t-CO_2

【Applicant】
- Hannan City
- Ozaki Fishing Cooperative Association
- Nishi-tottori Fishery Association
- Shimosyo Fisheries Cooperative Association
- NPO Institute of Environmental Restoration

18 Creating Seaweed Bed Environments at Kansai International Airport (KIX)
Kansai Airports

Kansai

Gently sloping rubble mound type were adopted for the seawall on KIX islands.
Continuous seaweed bed cultivation and maintenance activities and monitoring surveys are conducted.

Overview

- The seawalls was built with consideration to the marine environment, and gently sloping rubble mound type was used for most of the part of the 24 km long seawall.
- A rich seaweed bed environment has been created by allowing light to reach a wide area, and monitoring surveys have been continuously conducted over the years to cultivate and maintain the seaweed beds.
- In April 2023, seaweed collected at Kansai International Airport was transplanted in Hannan City as part of the "Osaka Bay Sea Forest (seaweed bed) Conservation and Restoration Project."
- In October 2023, the site was certified as a "nature symbiosis site" by the Ministry of the Environment.

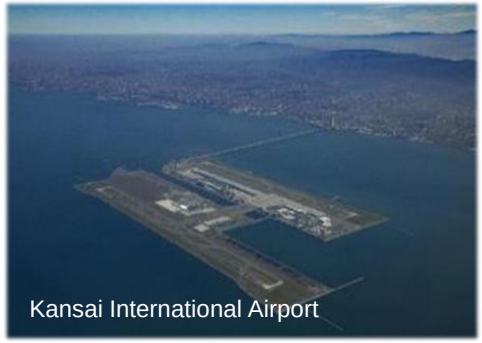
Basic Information

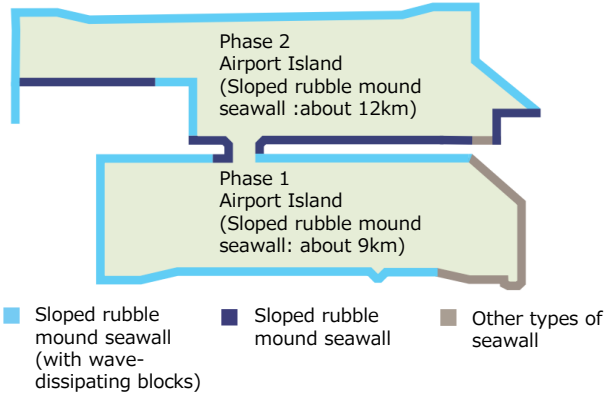
Region	Izumisano City, Tajiri Town, Sennan City (Seawalls on the Kansai International Airport islands)
Participating organizations	Kansai Airports
Start year	Phase 1 Airport Island Seawall completion in 1988 Phase 2 Airport Island Seawall completion in 2001
Contents of activities	• Adoption of gently sloping rubble mound seawall • Installation of blocks and other substrates • Seeding of seaweeds and transplanting of mother algae • Ongoing monitoring surveys
Site area	54ha (Area of seaweed beds, Survey Results March2022)
Amount of CO2 absorption	103.2 t-CO2 (J Blue Credit,5years from FY2017 to FY2021:103.2t-CO2)

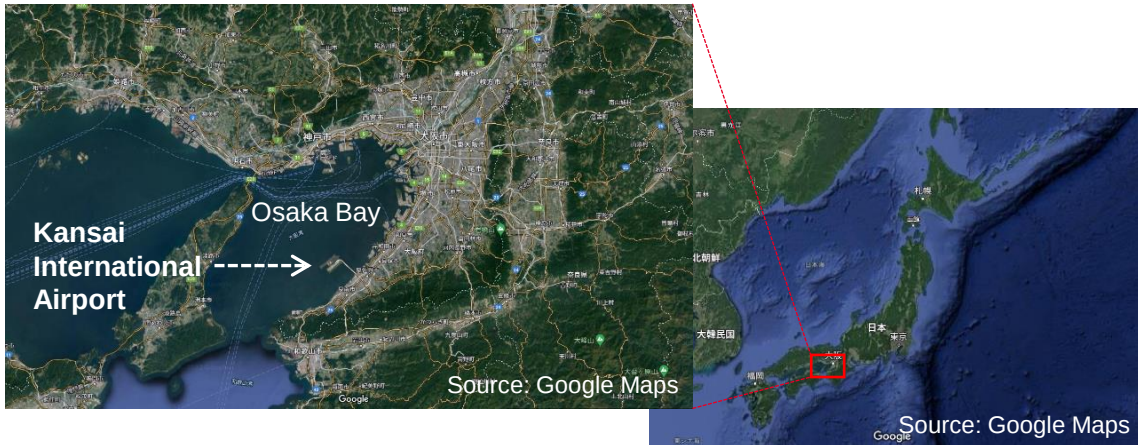
Kansai International Airport

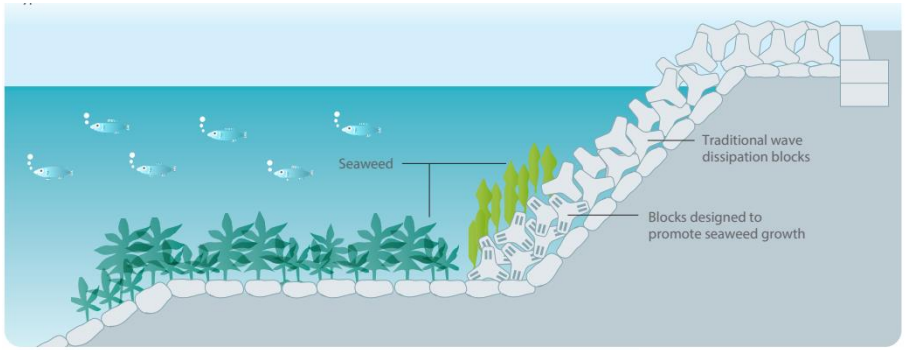
Overview

- The airport was built on reclaimed land in an area about 5 km off the coast of Senshu, southeast of Osaka Bay, at an average depth of 18 to 20 meters.
- Opening: 1994
  - Phase 1 Airport Island: Gross area 510ha, seawall completion in 1988
  - Phase 2 Airport Island: Gross area 545ha, seawall completion in 2001
- From the beginning of the project, the construction was carried out with consideration to the marine environment, and gently sloping rubble mound type seawall was used for most of the part of the 24 km long seawall.









Sloped rubble mound seawall

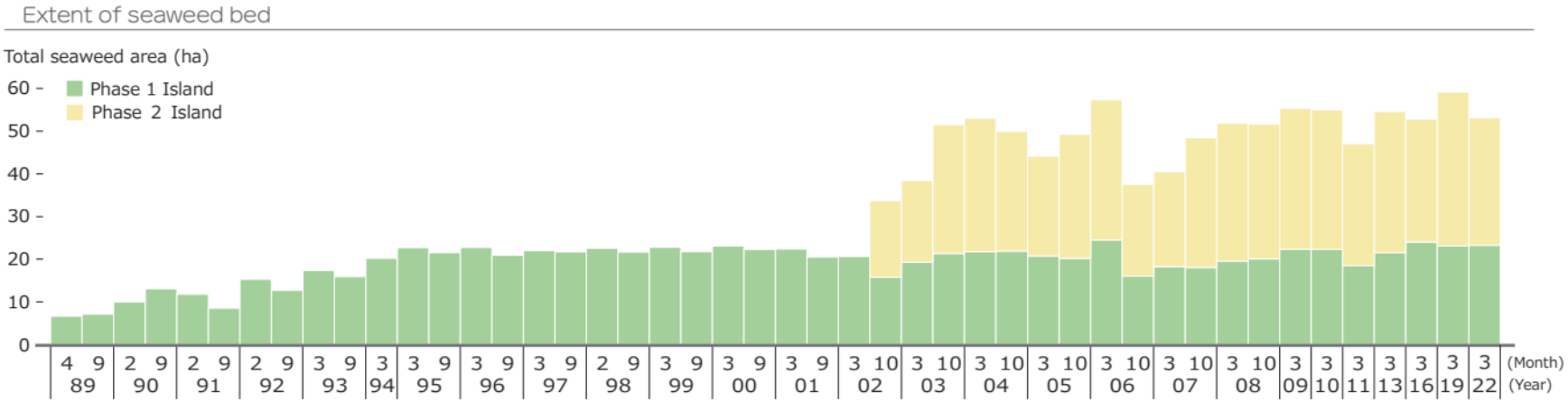
Seaweed bed at Kansai International Airport

Features

- Due to the use of low-gradient slopes for the seawall that allows light to reach a wide area and the active development of various innovations during the creation of the airport islands, a rich seaweed bed environment has been created, causing a wide variety of creatures to live around the airport islands, mainly in the seaweed beds.
- Immediately after seed transplantation began on the ‘Phase 1 Airport Island’ in April 1989, seaweed distribution surveys began. Continuous monitoring surveys have been taken out for over 30 years.
- In a survey conducted in March 2022, it was confirmed that the total area of seaweed beds on the entire airport islands was 54 ha. This area is equivalent to approx. 20% of the total seaweed bed area in Osaka Bay and contributes to the supply of marine resources as a spawning and nurturing ground, water purification, and to the reduction of CO2 emissions through the absorption of CO2.
- In recent years, seaweed bed restoration have been implemented, not just monitoring surveys, aiming to maintain and expand a rich seaweed bed environment.

Juvenile rockfish gathered in the Garamo field

Ecklonia cava



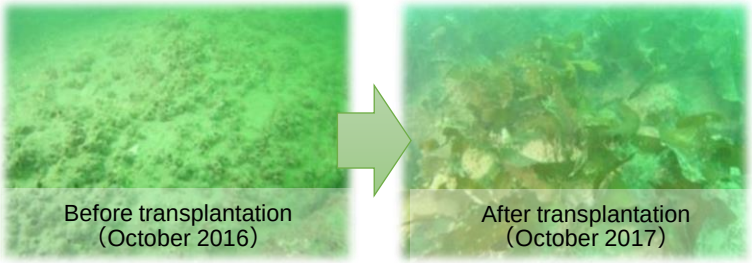
Creation of a rich seaweed bed environment (recent projects)

Restoration of seaweed beds by transplanting mother algae

- In addition to periodic monitoring surveys, seaweed bed preservation measures were implemented in response to changes in the seaweed bed environment as indicated by research results, as well as shore protection works involving the installation of wave-dissipating blocks.
- When transplanting mother algae, attention was paid to the materials used, and various measures were taken, such as using natural and biodegradable materials.

Transplantation of *Ecklonia cava* mother algae (2016-2017)

- In the monitoring survey, a sharp decline in *Ecklonia cava*, a type of large seaweed on the airport islands, was observed, so transplantation of mother algae was implemented.
- One year after transplantation, the growth of *Ecklonia cava* was confirmed in the vicinity of the transplantation site.



Restoration of seaweed beds following installation of wave-dissipating blocks (FY 2019-2021)

- With the installation of wave-dissipating blocks as a measure to strengthen disaster prevention functions following the damage caused by Typhoon Jebi in 2018, the loss of existing seaweed beds were predicted.
- Therefore, to quickly restore a rich seaweed bed environment after the installation of the blocks, a project was planed before the construction to transplant and install seaweed beds using mother algae from the *Ecklonia cava*, wakame seaweed, and sargassum.

Creation of a rich seaweed bed environment (recent projects)

Thinning survey of marine life on the seawall around the airport islands (from 2010)

- The purpose of this project is to understand the habitat conditions of marine life in the waters surrounding the airport islands, to improve the environment of fishery resources in Osaka Bay.
- The useful species of fisheries caught (bigeye tuna, scorpionfish, snapper, leather fish, sea cucumber, etc.) are released into the coastal areas of Osaka Prefecture to increase their stocks. As for the Hong Kong Grouper, a luxury fish that Osaka Prefecture aims to brand, individuals of 30 cm or smaller are offered to related organizations in Osaka Prefecture as spawning parent fish to increase Hong Kong Grouper resources in Osaka Bay.

Picking up the fish basket

Sorting and measuring

Releasing catches

J Blue Credit certification (December 2022)

- Seaweed beds around KIX are recognized as a CO2 absorber.

- The amount of CO2 absorbed by seaweed growing on the seawall around Kansai International Airport has been quantified, and J Blue Credits* have been certified and issued.
  The environmental creation of seaweed beds that has happened so far has developed into an initiative that also leads to a reduction in CO2 emissions.

CO2 absorption: 103.2 t-CO2
(for 5 years from FY2017 to FY2021)

J Blue Credit Certification

*J Blue Credit: Blue carbon quantified into tradable credits.

Development of Seaweed Bed Environment Creation Initiatives

Cooperation with local government (Hannan City) (from February 2023)

- Osaka Bay Sea Forest (seaweed bed) Conservation and Restoration Project -

- Working together to create a rich marine environment through collaboration between the region and the airport.
- Registered for the Co-Creation Challenge of the "TEAM EXPO 2025" program at Expo 2025 Osaka Kansai.
- In April 2023, seaweed collected at Kansai International Airport will be transplanted in the sea of Hannan City.

Certification by the Ministry of the Environment as a nature symbiosis site (October 2023)

- A new certifying system from the Ministry of the Environment known as “nature symbiosis site" was officially launched in FY2023. This system certifies areas where biodiversity is being conserved through the efforts of the private sector.
- The seaweed beds at Kansai International Airport were certified in October 2023 in recognition of the fact that they provide ecosystem services and are an important site for biodiversity conservation in Osaka Bay.

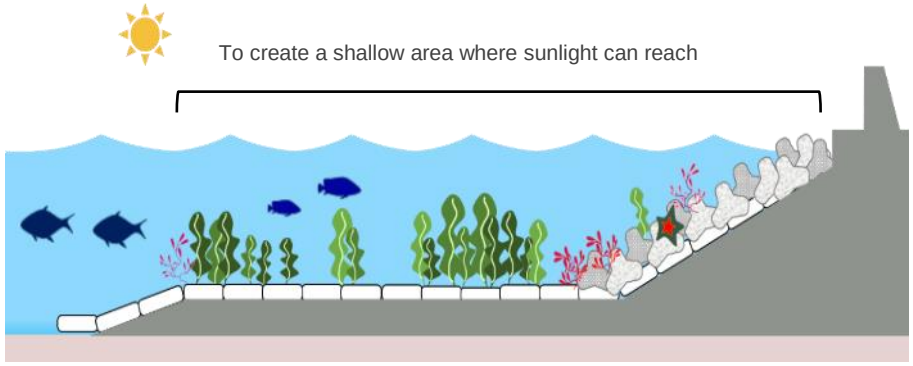
19 Blue Carbon Creation Project at Kobe Airport Island (Kobe City)

Kansai

Construction of a wide range of shallow areas where sunlight can reach, development of waterfront space through artificial sand and rock beaches, and implementation of monitoring studies to determine the effects of fostering and creating ecosystems.

Overview

- For the construction of Kobe Airport Island, which opened in 2006, the surrounding seawalls were constructed with gently sloping masonry to create a wide shallow area exposed to sunlight.
- By arranging artificial sand beaches and rock beaches, a rich ecosystem and environment was created, and developed a public-friendly waterfront space.
- Monitoring studies were conducted from the beginning of the project in order to understand the effects of the gently sloping seawalls on the development and creation of ecosystems.



Basic Information

Region	Kobe City (Seawalls on the Kobe Airport island)
Participating organizations	Kobe City
Start year	1999
Contents of activities	• Installation of rocks, blocks, or other substrate • Adjustment of water depth
Site area	–
Amount of CO2 absorption	9.3 t-CO2 (J Blue Credit,5years from FY2017 to FY2019:9.3t-CO2)

Project Characteristics and Key Points

- Around the Kobe Airport island, a large shallow area extending 6.7 km in length has been artificially constructed, which is home to a variety of marine life and has nurtured and created a rich ecosystem.
- In addition to the extensive growth of seaweed beds, such as *Sargassum filicinum* Harvey and *Undaria pinnatifida* (wakame seaweed), in the surrounding shallow waters, many fish species, including Japanese red seaperch and Pearl-spot chromis, have also been observed, creating a rich ecosystem. It has also become a popular fishing spot for a wide variety of fish species throughout the year, contributing as a recreational space for the citizens.
- Funds from this project are planned to be used to support the conservation and creation of blue carbon by private organizations as part of efforts to create a carbon neutral port (CNP) at the Port of Kobe and to decarbonize the Kobe Airport.

Part of the revetment is open for fishing and attracts many people.


Sea turtle conservation activities are conducted on the artificial beach of the airport island.


Sargassum filicinum Harvey


Undaria pinnatifida (wakame seaweed)

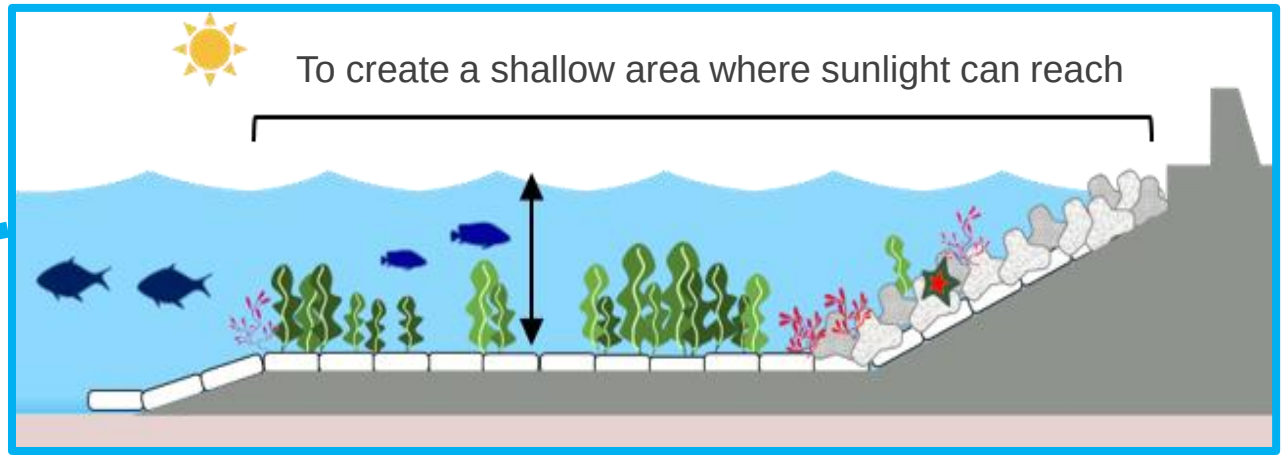

Japanese red seaperch


Pearl-spot chromis

Overview

1999: Start of land development
2001: Seawall construction
2006: Opening of Kobe Airport

- Seawall: Gently sloping masonry seawall using wave-dissipating blocks, etc.
- Objective: To create a shallow area where sunlight can reach → Nurture a variety of organisms, purify water quality
- Scale: Used in approx. 6.7 km of the 7.7 km long revetment perimeter



Monitoring Surveys

- To understand the effect of the gently sloping seawall on the development and the creation of ecosystems, monitoring surveys have been conducted from the initial phase of the seawall construction.
- The amount of CO2 absorption (9.3 tons) certified for Kobe Airport Island in FY2022 was calculated based on the results of these surveys.

Image of monitoring process（Taken underwater）

Sargassum filicinum Harvey

Undaria pinnatifida
(wakame seaweed)

Future Development

- Monitoring surveys were also conducted in Port Island (Phase 2) and Meriken Park, where a similar gently sloping seawall has been constructed (February 2023).
- After evaluating the seaweed beds in these areas, we plan to apply for a CO2 sink certification.

Ulva sp. (Sea lettuce)
(Port Island)

Undaria pinnatifida(wakame seaweed),
Sargassum muticum (Meriken Park)

Future Initiatives

- The funds generated by this project will be used to support advanced verification initiatives such as blue carbon conservation and creation activities and the formation of seaweed beds (plans include providing assistance programs and verification fields).

- The aim is to also achieve environmentally friendly community development in waterfront redevelopment.

- New waterfront space is planned to introduce environmentally friendly seawalls and to be used as a place for environmental education.

Kobe Waterfront Vision（December 2022）

20 Creation of Seaweed Beds, Tidal Flats and Habitats for Living Organisms in Hyogo Canal (Hyogo Fishery Cooperative Association)

Kansai

Establishment of a shallow area in Hyogo Canal, creation of eelgrass beds through regional cooperation, and implementation of environmental beautification activities.

Overview

- Creating seaweed beds by seeding and transplanting eelgrass on the Hyogo Canal tidal flat created by using stones and sand generated from the removal of the fifth breakwater at the Port of Kobe.
- Fishermen and university students cooperated to conduct periodic monitoring surveys of the tidal flat's water purification and CO2 fixation capabilities.
- The tidal flats are used by local elementary schools for environmental education, while environmental beautification activities are conducted in cooperation with local organizations to raise awareness of environmental beautification.

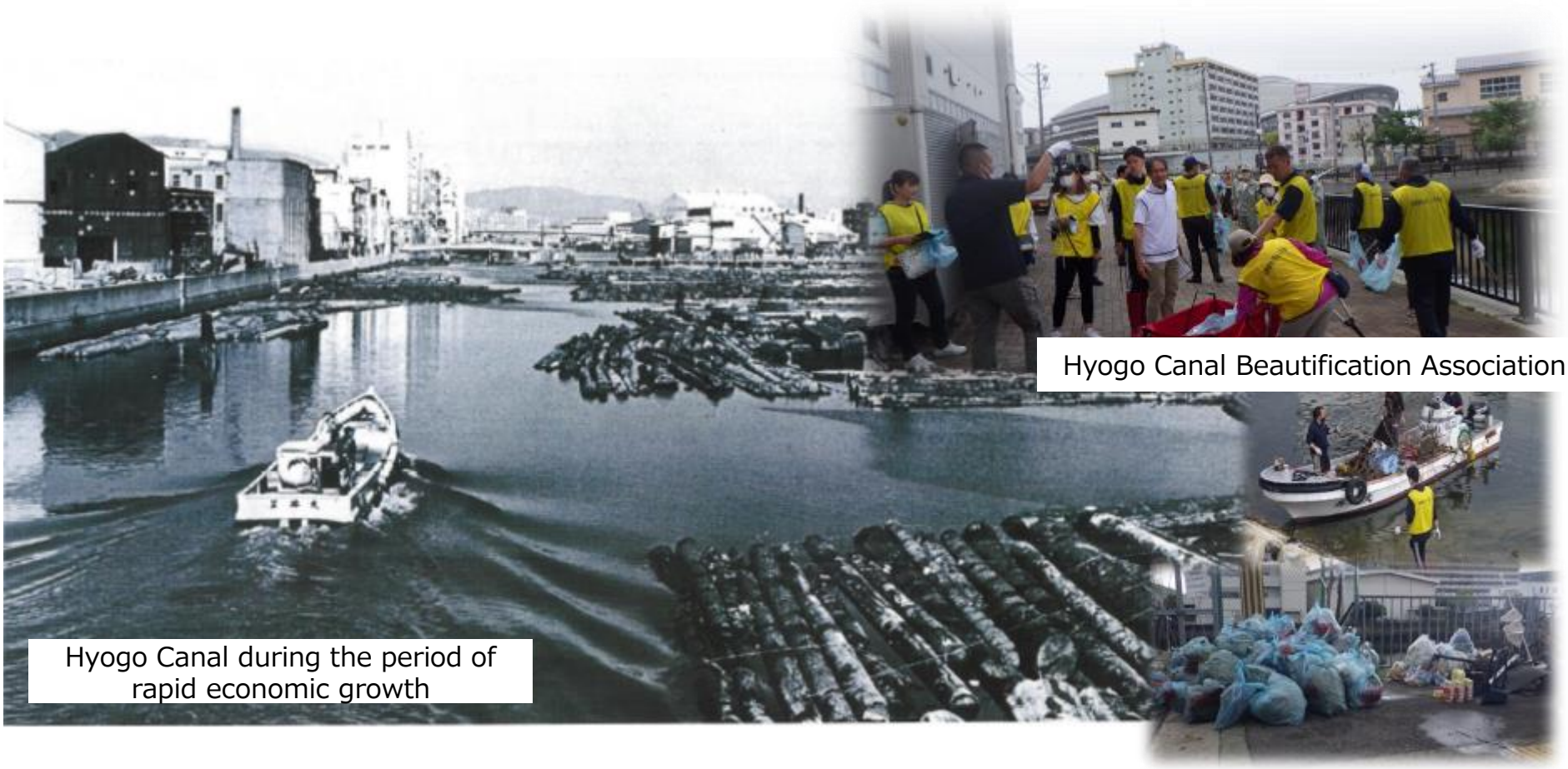
Basic Information

Region	Kobe City
Participating organizations	Hyogo Fishery Cooperative Association, Hyogo Canal Beautification Association ,Hamayama Elementary School, Hyogo Waterside Network, Hyogo Canal Pearl Shell Project
Start year	2019
Contents of activities	• Seeding of seaweeds and transplanting of sporophyte • Sand covering and water depth adjustment • Environmental education and public awareness (exchange with other organizations, incorporation into elementary school curriculum)
Site area	34ha
Amount of CO2 absorption	2.1t-CO2 (J Blue Credit,2years from FY2021 to FY2022:2.1t-CO2)

About Hyogo Canal

- The Hyogo Canal was completed in 1899 and used as a storage area for imported lumber after the war.
- Many lumber companies and other businesses were located near the canal, and during the period of rapid economic growth, the water was polluted by wastewater from the factories.
- The environment has been greatly improved through sewage maintenance and cleanup activities by the Hyogo Canal Beautification Association*.

*The association aims to contribute to the local community by purifying the water quality of the Hyogo Canal and beautifying the surrounding landscape, and its members include companies and organizations in the area around the canal.

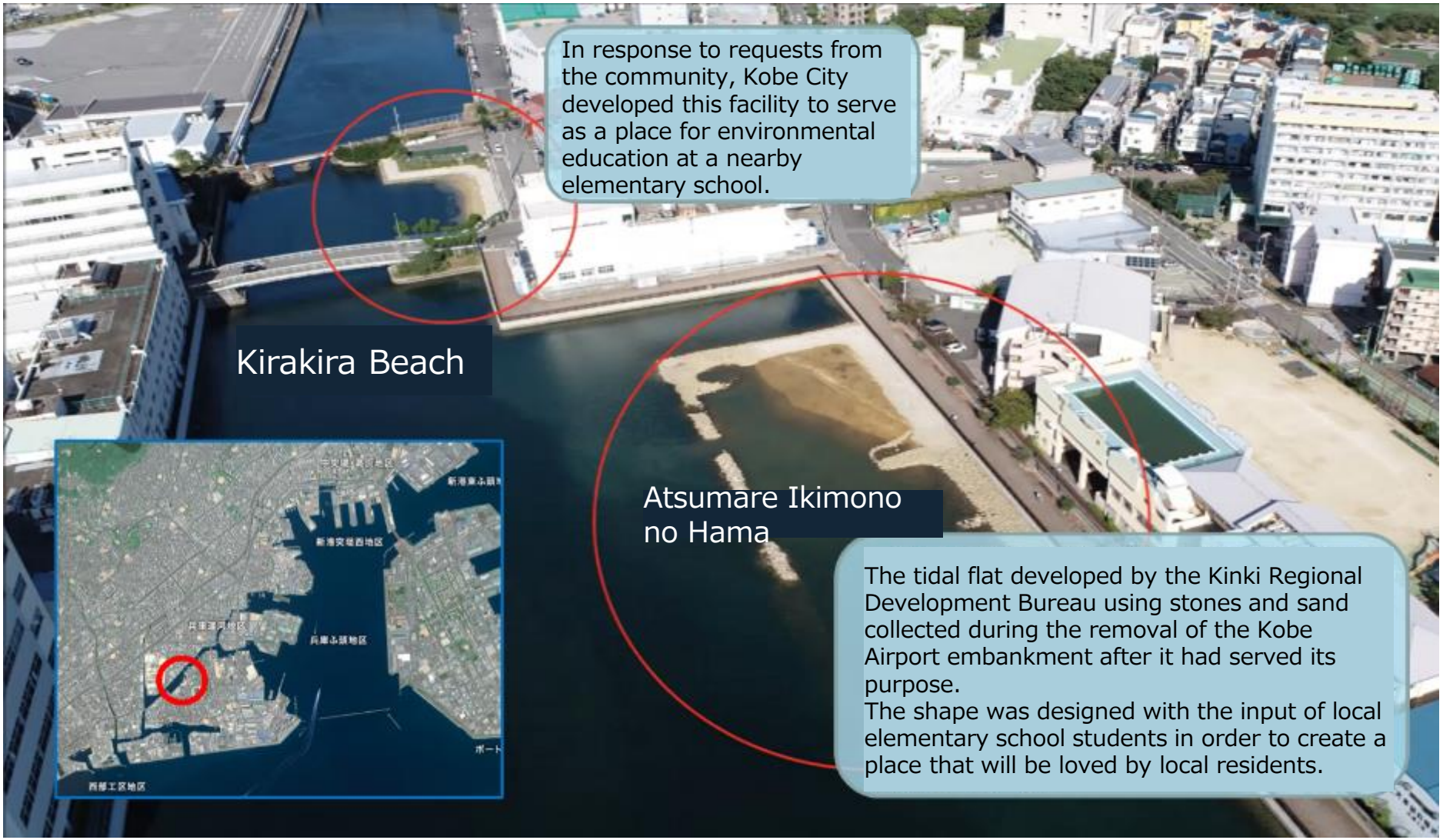


Hyogo Canal Beautification Association

Hyogo Canal during the period of rapid economic growth

Motivation for Initiatives

- To further enhance the environment, the City of Kobe and the Kinki Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism have constructed a shallow area in the Hyogo Canal (Kirakira Beach: 2019, Atsumare Ikimono no Hama: 2020).
- Local elementary school students, the community, and the government worked together to determine the shape and other details.



Environmental Activities and Education in the Shallow Area

- Activities of various groups were created in the shallow areas that were developed, and the groups began to collaborate on environmental activities.

Environmental education at local schools

Clam project (3rd grade)

Osaka Bay Biological Survey

Eelgrass transplantation class (4th grade)

Collaboration with Vissel Kobe "Kobe Port Environment Class"

Clam research

Environmental education

Fish touching pool

Canal 24-hour survey (high school students in Osaka)

DNA sampling

Measuring sampled water

Analysis of collected materials

Parent-child clam research class

Creation of J Blue Credits for Hyogo Canal

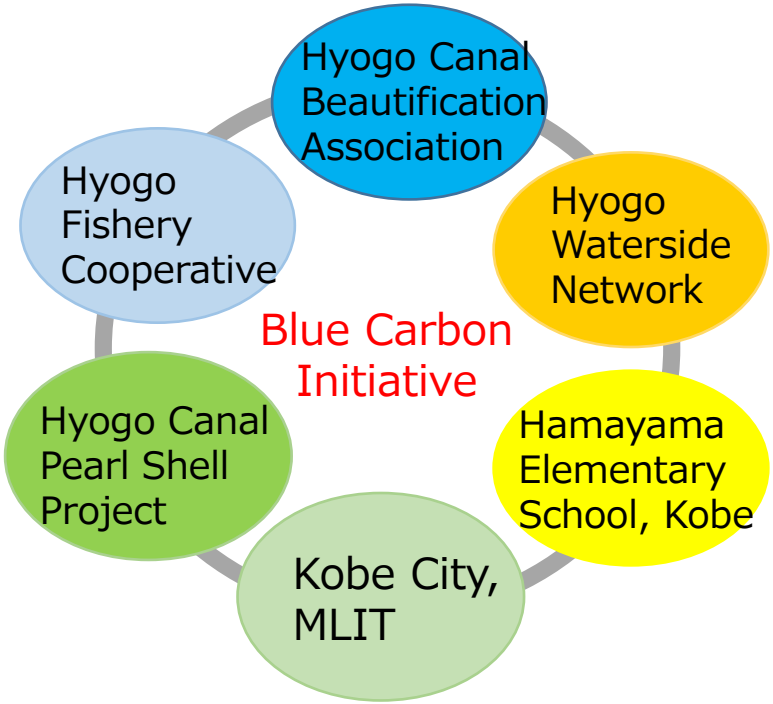
- Eelgrass and seaweed species have thrived in the shallow area that has been developed.
- The environmental activities and education conducted in the community were also highly regarded, and J Blue Credit was approved in FY 2021, and the certification was also granted in FY 2022.
- Environmental activities are becoming more active through Blue Carbon initiatives.

Five local environmental groups* collaborated to issue 2.1 [t-CO2]/year of J-Blue credits.

*Hyogo Fishery Cooperative Association, Hyogo Canal Beautification Association, Kobe Municipal Hamayama Elementary School, Pearl Shell Project, Waterfront Network

Result of public solicitation

Credit transactions with 29 companies and organizations



- Through the Blue Carbon initiative, cooperation among organizations has strengthened, leading to increased activity.
- We will promote the participation of companies and organizations that have purchased credits in our activities.

Ripple Effects of Initiatives

- Blue Carbon initiatives are having various ripple effects such as creating interactions with other regions.

Interactions with other local organizations

Eelgrass summit

Interaction through the collection of flowering stems of eelgrass

Interregional interactions of elementary school children

Media coverage

- Covered by TV news repeatedly.
- Articles also published in newspapers “Hyogo's Canals, Now a Fish Paradise Locals cleanup the canal known to be dirty and smelly in the 60s”

As a curriculum for elementary school classes

Clam project (3rd grade)

Eelgrass transplantation class (4th grade)

Learning about the fishing industry (5th grade)

Bringing liveliness to the Hyogo Canal

Interview with Nagoya's Nakagawa Canal Boat Navigation aiming to operate Hyogo Canal Cruise.

Fish touch pool at the canal event