

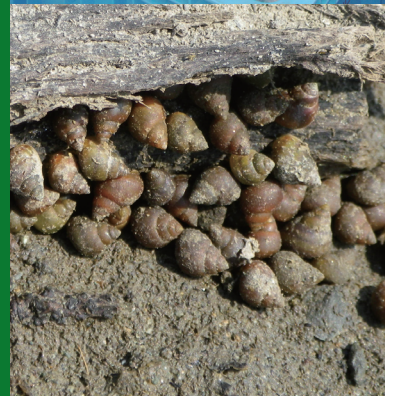


WWF

REPORT

JPN

2013



WWF Japan Report on the Nature and Livelihood Recovery Project

[Executive Summary]

A prelim assessment of ecological and social-economic changes in selected areas affected by the Great East Japan Earthquake, 2011



1. Project Outline



Summary

In July 2011 WWF Japan launched its Nature and Livelihood Recovery Project in two model areas, Minamisanriku Town (Shizugawa Bay) in Miyagi Prefecture and Soma City (Matsukawaura Lagoon) in Fukushima Prefecture. The aim of the project is to support the recovery and conservation of the natural environment and fishery/aquaculture industry improvement in sustainable manner in the Pacific coast of East Japan, which suffered catastrophic damage in the Great East Japan Earthquake and Tsunami. In the first year of this five-year project, WWF conducted natural environment surveys (on topography, land use, seaweed beds, benthic animals, and birds), marine pollution surveys (on toxic chemicals and radioactive materials), and fishery economics surveys (identifying the issues facing production structures and fishery recovery, etc.) depending on the characteristics of the natural environment and social conditions of selected demonstration sites. As well as understanding the current situation, this project also tried to identify regional concerns and priority issues by sharing information and building relationships with regional stakeholders (mainly people connected to the fishery industry). From the second year, the project provided further support for the restoration of the demonstration sites by conducting joint monitoring with regional stakeholders and organizing activities such as seminars for a more sustainable fishery industry.

Project goals

The Great East Japan Earthquake and Tsunami that struck on March 11, 2011 had a massive impact on the livelihood of coastal residents and the natural environment. This included topographic changes, ground subsidence, changes in terrain and environment on the seabed and shore due to the movement of sand and mud, destruction of seaweed beds and coastal ecosystems, the leakage of toxic chemicals from various debris, and the radioactive contamination due to the accident at the Fukushima Daiichi Nuclear Power Plant.

These have not only had a huge effect on the flora and fauna whose habitats are along the coast but also greatly hampered the recovery of the fishery industry which is based on the marine biodiversity. Assessing the environmental impact and supporting the recovery activities will contribute to the restoration of the fishery industry. Or to put it another way, the economic recovery of the devastated coastal areas requires not only the reconstruction of the production and distribution systems related to coastal fisheries, but also the recovery and regeneration of the natural environment for the fishing grounds.

WWF therefore launched a project that aims to conserve and restore biodiversity in the damaged areas while also establishing sustainable resource management, by conducting on ground surveys on the damage status of the environment and the fishery industry, collaborating and sharing information with local residents, and supporting transformation to sustainable fishery.

The principles for implementing the project were as follows. The project also took adaptive management approach according to the each recovery status and built relationship respectfully with other groups such as domestic NPOs.

- The project holds discussions with the various stakeholders in the model areas (on a regional government or ecosystem level) and understands the actual situation and demands.
- The project examines measures for restoring the natural environment by gathering scientific data, identifying the current situation as well as monitoring the subsequent recovery status, and helps to implement those measures.
- The project instills an understanding of the idea that biodiversity conservation contributes to the promotion of regional industries such as fishing, and aim to construct a multi-stakeholder involvement.
- The project provides suitable information and recommendations to central and local governments so that their restoration plans do not adversely affect the natural environment along the coast.

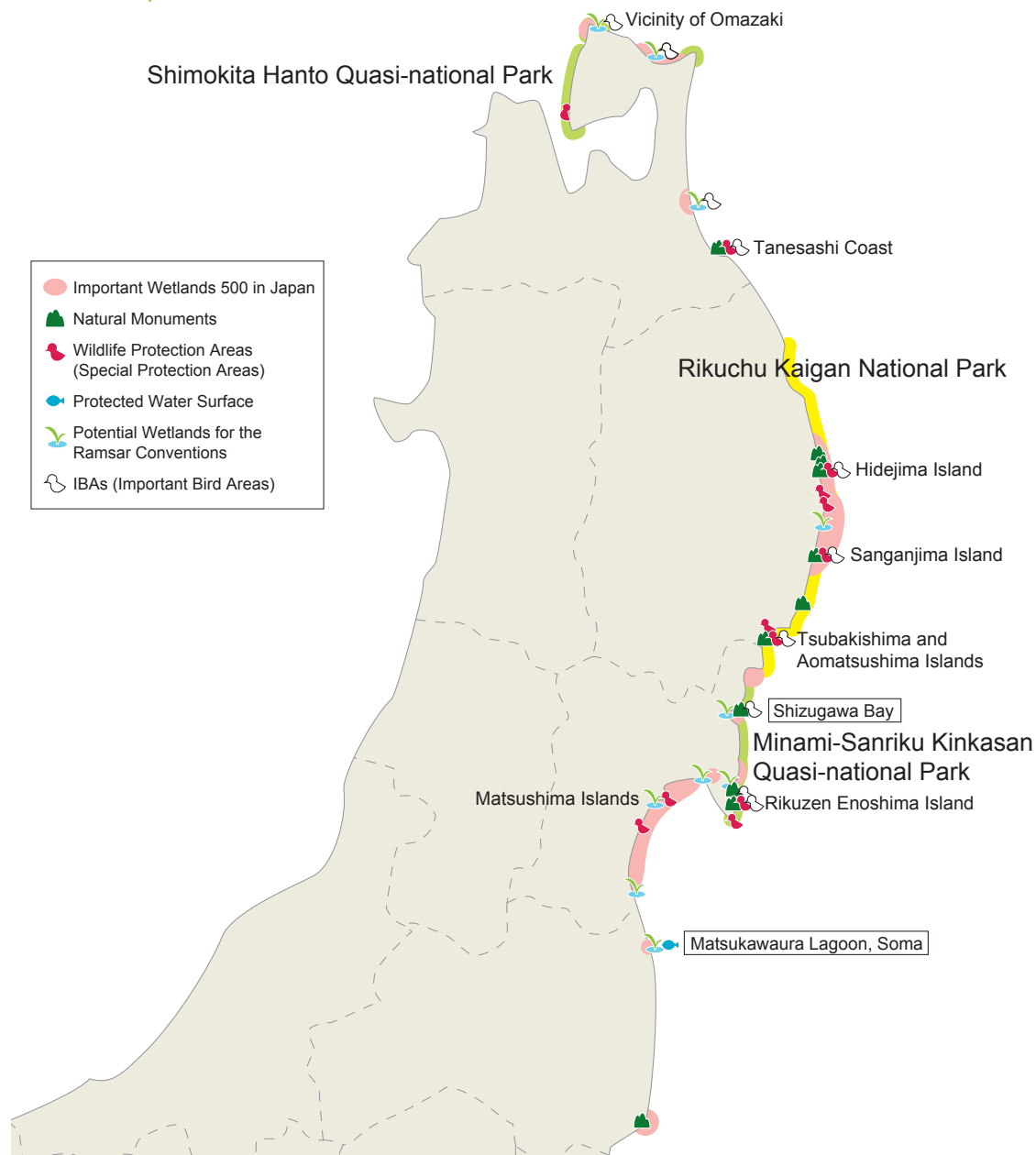
Process of selecting demonstration sites

When selecting areas for our project to support, WWF focused on two points: (1) whether there is a high conservation value of coastal biodiversity, and (2) whether the fishery industry has a high profile there. Figure 1 shows areas of importance in terms of biodiversity in

[Table 1] Important areas in terms of biodiversity along the Pacific coast of Iwate, Miyagi and Fukushima

	Iwate	Miyagi	Fukushima	Total
Natural parks, Special Protection Areas	7	3		10
Natural parks, Marine Park Areas		3		3
Wildlife Protection Areas, Special Protection Areas				10
Natural Monuments	6	3	1	10
Important Wetlands 500	2	5	2	9
Potential Wetland for the Ramsar Convention	1	5	1	7
Important Bird Areas (IBA)	3	3		6
Protected Water Surface			1	1

[Figure 1] Important areas in terms of biodiversity conservation along the East Japan Pacific coast (Aomori to Fukushima)



[Table 2] List of WWF Japan's Disaster Recovery Support Project Study Committee Members

Field	Study committee members (titles omitted)	Affiliation
Fishery economics	Osamu Baba	Department of Marine Policy and Culture, Tokyo University of Marine Science and Technology
Anthropology	Satsuki Takahashi	University of Tokyo (at that time)
Topography	Hitoshi Hasegawa	Faculty of Letters, Kokushikan University
Seaweed beds	Shogo Arai	Marine Algae Research Co., Ltd.
Benthic animals	Takao Suzuki	Faculty of Science, Tohoku University
Birds	Toshifumi Moriya	Japan Bird Research Association (NPO)
Chemical pollutants	Shinsuke Tanabe	Center for Marine Environmental Studies, Ehime University

the Pacific coastal region of East Japan. WWF identified national parks and quasi-national parks, special protection areas of wildlife protection areas, natural monuments, protected water surface, the Important Wetlands 500 in Japan, potential wetlands for the Ramsar Convention, and Important Bird Areas (Table 1). This shows that the Pacific coast of East Japan has many areas of high biodiversity.

From these criteria, WWF selected Miyako City in Iwate Prefecture, Minamisanriku Town in Miyagi Prefecture, Soma City in Fukushima Prefecture, Oarai Town in Ibaraki Prefecture, and Kashima City in Ibaraki Prefecture as candidate areas and visited them to hear from fishery operators, governments and civilian groups about the state of the damage, the challenges facing restoration, and so on.

WWF also invited experts on fishery economics, anthropology, topography, seaweeds, benthic animals, birds, and chemical pollutants to a study meeting on June 27, 2011. Having shared the latest information and their challenges in each field, WWF then considered and set the strategy of the project. The Study Committee raised concerns about the possibility of restoration plans being drawn up without due consideration for the impact on biodiversity and the needs and dynamics of regional communities, and expressed the desire that WWF propose and execute a model for nature regeneration and subsequent fishery restoration.

Having gathered and examined further information and considered the opportunities and willingness for involving the project, WWF selected Minamisanriku Town (Shizugawa Bay/Tokura district) in Miyagi Prefecture and Soma City (Matsukawaura Lagoon) in Fukushima Prefecture as the two model activity areas. While they are both disaster areas, they differ in terms of damage status, natural environment, and the condition of their fishery industries and so require support that matches their respective current situations.

Outline of demonstration sites

Outline of the natural environment and social conditions in Minamisanriku Town, Miyagi Prefecture and Soma City, Fukushima Prefecture

Demonstration site 1: Minamisanriku Town (Shizugawa Bay), Miyagi Prefecture

Minamisanriku Town is located in the northeastern part of Miyagi Prefecture and looks out on Shizugawa Bay and Isatoma Bay. Shizugawa Bay, part of the Minami Sanriku Kinkasan Quasi-national Park, is home to a wide variety of seaweeds including four types of eelgrass, and various species of brown algae and has been designated by the Ministry of the Environment as one of the Important Wetlands 500 in Japan (2001) and a potential wetland for the Ramsar Convention (2010). Tsubakishima Island in the bay has a climax forest of *Machilus thunbergii* trees, which is registered as a natural monument of Japan under the name Tsubakishima Warm Region Plant Colony (1966).

The main fishery industry of Shizugawa



Panoramic view of Shizugawa Bay



Silver salmon cultivation



Oyster cultivation

Bay is centered around the aquaculture of wakame seaweed, oysters, scallops, coho salmon, and so on. The Tokura Branch of the Miyagi Prefectural Fisheries Association's Shizugawa Office decided on a policy of halving its number of cultivation facilities after the tsunami disaster in order to remedy over-cultivation (especially of oysters), regarded as a problem from before the disaster, with the aim of rebuilding a better quality and more environmentally friendly aquaculture industry.

Demonstration site 2: Soma City (Matsukawaura Lagoon), Fukushima Prefecture

Soma City is located in the northeastern part of Fukushima Prefecture, where the Matsukawaura lagoon stretches 5 kilometers long from south to north and 1.5 kilometers wide from east to west. As a tidal wetland that is home to a wide variety of benthic animals such as *Assimineia* sp. and *Chaetopterus variopedatus* as well as a species of damselfly called *Mortonagrion Hiroseii*, Matsukawaura has been designated by the Ministry of the Environment as one of the Important Wetlands 500 in Japan and a potential site for the Ramsar Convention, as well as being designated as a Fukushima Prefectural natural park. The waters of Isobe Ohama facing the Pacific Ocean have also been designated as protected water surface for the Sakhalin surf clam.



Japanese littleneck clams

The main fishery industries in Matsukawaura are green laver (*Monostroma nitidum*) cultivation and Japanese littleneck clams fishery. The Pacific coast used to provide abundant fishing for flatfish, Sakhalin surf clams, snow crabs, and others, but fishing operations throughout Fukushima Prefecture are now voluntarily suspended (as of June 2012) due to the impact of radioactive contamination from the accident at the Fukushima Daiichi Nuclear Power Plant. Matsukawaura is also ranked among the top one hundred views of Japan and has a vibrant tourism industry supported by its rich marine resources and natural environment.

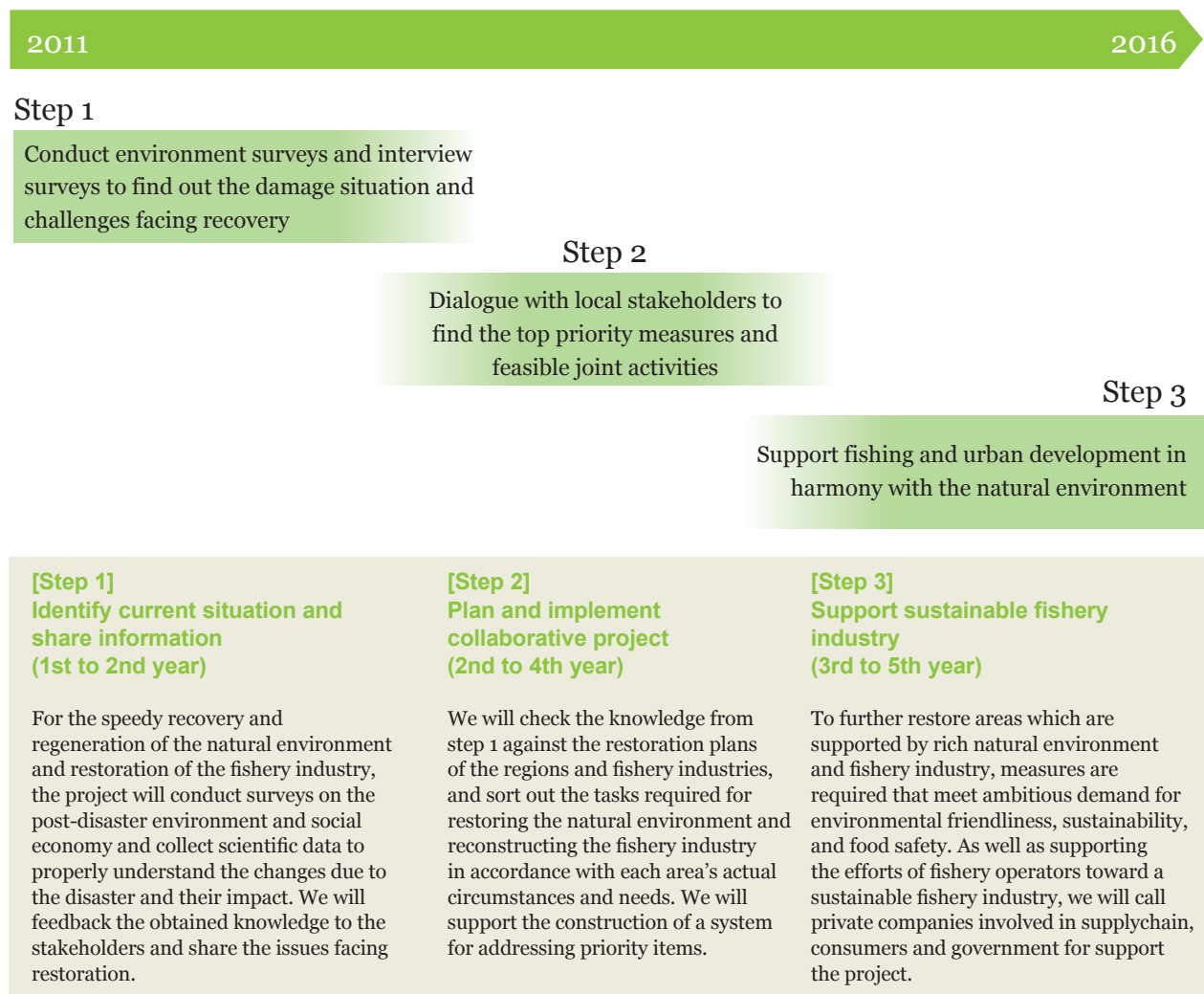
Project work plan

The activities of the Nature and Livelihood Recovery Project are being unfurled over a three- to five-year period depending on the recovery situation in the support areas, as shown in Figure 2, with the aim of regenerating the natural environment and biodiversity and supporting a sustainable fishery industry. Information on the results and challenges in the model areas will also be distributed among the various stakeholders from a wider area, with the aim of contributing to natural environment conservation and to establishing a sustainable fishery industry in coastal regions, including other disaster areas. As already mentioned, however, the project will remain flexible about modifying the project in accordance with changes or developments in the recovery status and social situation.



Green laver cultivation

[Figure 2] Project work plan



Project framework

In the first year of the project, natural environment surveys, marine pollution surveys, fishery economics surveys, and public outreach were conducted with focus on understanding the actual situation and sharing information (Figure 3). The project did natural environment surveys on topography and land use, seaweed beds, benthic animals, or birds by deciding the survey items depending on the characteristics of the natural environment in the support areas and the status of other groups' activities. The people in charge of the various activities are shown in Table 2.

For the results of the surveys, see the survey report in Part 2 of this report.



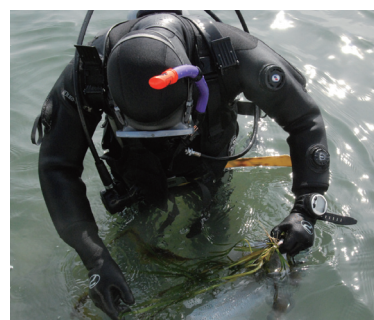
Topography and land use survey (Kokushikan University)



Benthic animal survey (Tohoku University)



Marine pollution survey (Ehime University)



Seaweed bed survey (Marine Algae Research Co., Ltd.)

[Table 3] People in charge of surveys (1st year)

	Survey items	Researchers in charge (titles omitted)		Implementation area
Natural environment	Topography/Land use	Kokushikan University	Hitoshi Hasegawa	Soma
	Seaweed beds	Marine Algae Research Co., Ltd.	Shogo Arai	Minamisanriku/Soma
	Benthic animals	Tohoku University	Takao Suzuki	Soma
	Birds	Japan Bird Research Association (NPO)	Toshifumi Moriya	Soma
Marine pollution	Toxic chemicals Radioactive materials	Ehime University	Shinsuke Tanabe Tomohiko Isobe	Minamisanriku/Soma
Fishery economics	Production structures, etc. Fishery recovery policy	Tokyo University of Marine Science and Technology	Osamu Baba	Minamisanriku/Soma
Publicity	Disseminating/sharing information Holding report meetings	WWF Japan		Minamisanriku/Soma



Bird survey (Japan Bird Research Association)

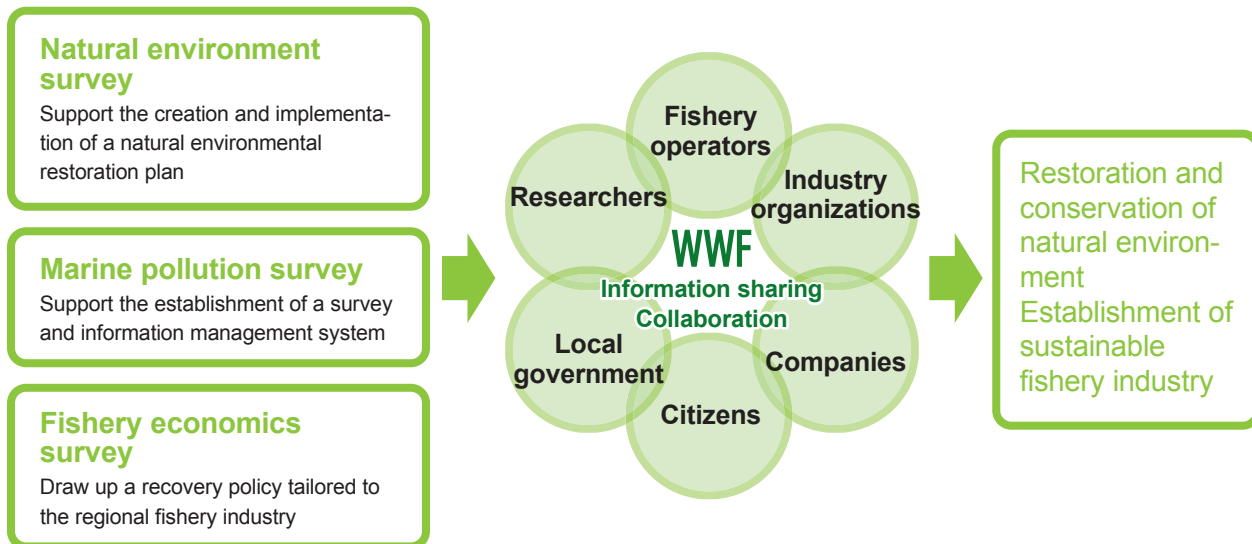


Fishery economics survey (Tokyo University of Marine Science and Technology)



Media coverage/publicity (WWF Japan)

[Figure 3] Project framework



2. Summary of Survey Key Findings and Discussion Points

WWF's Recommendations for Restoration



In July 2011, WWF Japan conducted various types of natural environment surveys (benthic animals, birds, seaweed beds, and topography and land use), marine pollution surveys, and fishery economics surveys in two model areas, Minamisanriku Town (Shizugawa Bay) in Miyagi Prefecture and Soma City (Matsukawaura Lagoon) in Fukushima Prefecture with the aim of supporting the proper recovery of the natural environment and the transformation to a more sustainable fishery industry in the areas damaged by the Great East Japan Earthquake and Tsunami.

In this section, WWF have compiled and arranged the information collected during these surveys and throughout this project into three categories: I. Regeneration of the natural environment; II. Dealing with marine pollution; III. Restoration of the fishery industry. Then, based on the survey results, WWF have reviewed the recovery of natural environment and a sustainable fishery industry in the disaster areas and finalized WWF Japan's recommendations for restoring the natural environment and reconstructing the fishery industry.

Finally, similar events are expected to have occurred in disaster areas other than the two model

areas surveyed. WWF believes that restoration should not be dependent only on the local governments and key stakeholder groups of the disaster areas as initiators, and it is desirable that the restoration is jointly implemented by a wider range of stakeholders (government bodies, industry groups, companies, researchers, NGOs, residents, etc.) according to their expertise, financing, and so on. The scientific knowledge and suggestions in this report will, alongside each area's unique features and local conditions, serve as a reference for the wider reconstruction of the fishery industry going forward.



Black-tailed gull

I. Restoration of the natural environment

[Key findings and discussion points]

1. The species numbers and population densities of benthic animals are similar to those in pre-disaster records, which suggest a trend toward recovery, although some species have still not been checked since the disaster. [Matsukawaura Lagoon]
2. As for birds, forest bird species declined due to the elimination of coastal forests but some water bird species showed an increase in numbers. Great cormorant and heron colonies were damaged, which could create new problems such as damage to fishing or noise and smell as those colonies relocate, disperse or change their home range. [Matsukawaura Lagoon]
3. There were concerns about the catastrophic damage the tsunami did to eelgrass beds, but they did survive in parts and newly grown roots have been observed in the furthest regions. There is a possibility that they will expand in size to form seaweed beds in future. [Matsukawaura Lagoon]
4. Although recovery from rocky-shore denudation was expected because of the decrease in algae-eating animals such as sea urchins, such denudation was still observed. Proper seaweed bed management by expelling sea urchins is desired, but stopping the distribution growth of sea urchins would be difficult with the spread of a consistent sedimentary environment. [Shizugawa Bay]
5. The silt component of sediment was lowered by the tsunami and many points had changed from being muddy to sandy. While increased densities are forecast for animals that favor a sandy environment



Eelgrass (Matsukawaura)



Assimineae sp.

such as Japanese littleneck clams, there are fears of a decline in animals living in muddy tidal flats. [Matsukawaura Lagoon]

6. Remaining driftwood and concrete rubble from the tsunami is functioning as a place for seaweed to grow, sea animals to spawn, and young fish to grow. [Matsukawaura Lagoon, Shizugawa Bay]
7. There are new kinds of places functioning as habitats for living creatures, including the swamp environments that appeared on land due to ground subsidence where many types of algae are growing, and unused rice fields where freshwater sandpipers and plovers were observed. [Shizugawa Bay, Matsukawaura Lagoon]
8. Large amounts of water springs, suggesting the possibility of an increase in spring water due to the effect of the earthquake (ground subsidence) and the possibility that a sandy environment will be sustained by spring water. [Matsukawaura Lagoon]
9. It was not proved whether changes to the environment that have been a problem from before the earthquake resulted from changes in surrounding land use, but the possibility remains that they were caused by changes in tidal currents due to the construction of port facilities or the decrease in underground seepage water due to the upgrading of agricultural waterways and so on. [Matsukawaura Lagoon]
10. WWF concerned that few local governments in the disaster areas have positioned conservation and regeneration of natural environment as priority issues in their restoration plans, and that they will conduct restoration work without due consideration for the natural environment.

[Proposals]

1. To conduct quantitative environmental monitoring
 - To monitor the recovery process quantitatively and change in biota in the natural coastal environment and record the state of change continually.
 - To conduct surveys on a continuing basis, provide the public with chances for participation in monitoring and develop leaders in environmental protection management.
 - To create a system for assessing the results of environmental protection and regeneration activities and the impact of restoration plans on the environment and communities, and be adaptive in



Restoration work in progress (Minamisanriku Town)

revising or upgrading plans as necessary.

2. To draw up environmental conservation and restoration plans and reflecting them in restoration plans

- To identify areas of high biodiversity and areas of outstanding scenery, and draw up and implement environmental conservation and restoration plans for them based on public participation.
- To position natural environment protection management within restoration plans so that restoration work does not add to the burden on the natural environment, result in the loss or degradation of ecosystem services (gifts of nature) and biodiversity, or have a serious impact on related industries or people's living environment.



Snorkeling school

3. To maintain and utilize new natural environments created by the disaster

- To consider utilizing new swamp environments created by ground subsidence as places for education or sightseeing.
- To consider proactively utilizing existing tsunami debris by deliberately leaving it as artificial fish reefs for seaweed and young fish to grow in.
- To take measures to increase the amount of underground seepage of rainwater and river water (such as abolishing winter-flooded rice fields and concrete-lined ditch) so that the sedimentary environment is sustained and improved by spring water.

4. To use areas proactively for environmental education and research

- To promote the acceptance of environmental education and scientific research, in order to train leaders in the monitoring and environmental conservation and regeneration activities in the above proposals 1 to 3 and to build an implementation system.
- To conduct experience-based programs for studying the natural environment and measures for environmental regeneration, guide training, and information offering, and develop new green tour programs.
- To build a system that acts as a global research hub with the theme of the earthquake and tsunami disaster's environmental impact and subsequent recovery, in order to accept researchers and tours.

[Who to implement the recommendations and their expected role]

Although scientific surveys are led by research institutions, their continuous implementation requires a budget and human resources and so it is desirable that researchers not only release their survey results but also collaborate with NGOs, governments, academia, etc. in order to contribute to developing community-based programs such as resident participation surveys and environmental education. Because the fishery and tourism industries depend heavily on coastal ecosystem services (gifts of nature), operators and others in related industries should be heavily engaged in activities related to proper conservation management and sustainable use of the natural resource. Local governments, too, should not only take care that their operations in the implementation of restoration plans do not have a significant adverse effect on the natural environment, but also adopt sound conservation and restoration plans and promote the meaningful conservation activities and restoration of natural environment.

II. Dealing with marine pollution

[Key findings and discussion points]

1. PCBs (polychlorinated biphenyls), HBCDs (brominated flame retardants) and PBDEs (polybrominated diphenyl ethers, brominated flame retardants) were detected in all analyzed marine life.
2. High concentrations of HBCDs were detected in some specimens, and it is speculated that this is a reflection of the high level of use of HBCDs in thermal insulating material in the Tohoku region.
3. A positive correlation was seen between trophic level (level in the food chain) and concentration of PCBs, HBCD and PBDEs, suggesting bioconcentration throughout the food chain.
4. PCB concentrations in Pacific cod were found to be about four times higher than before the earthquake and tsunami disaster, suggesting that the concentration of PCBs has been elevated by the disaster. However, the number of specimens in this survey was small and so further research is needed into the impact on human beings and wildlife.

[Recommendations]

1. To implement long-term monitoring of marine pollution and measure to prevent its increase
 - To conduct long-term monitoring of radioactive materials and toxic chemicals and investigate the impact of marine pollution on living creatures and ecosystems.
2. To Gather and disseminate proper information
 - To establish a format for gathering and releasing data and information on marine pollution, and release information in a prompt and highly transparent way.
 - To convey the types of exposure risks that do or do not exist, and convey accurate ways of coping with the presence and extent of those risks.
3. To prevent the spread of marine pollution
 - To dispose of tsunami debris and waste properly and develop countermeasures to toxic matter to protect the entire marine ecosystem.

[Who to implement the recommendations and their expected role]

In collaboration with NGOs and companies, government bodies, researchers, and related industry groups are expected to conduct continuous marine pollution surveys and actively release their survey results and information on countermeasures, stop the spread of pollution and reduce the exposure risk for human beings and wildlife. The journalists should release the information on countermeasures in addition to survey results and the risks of exposure based on scientific evidence appropriately so that the public can respond properly and calmly. It is desirable that the public make an action by accurately recognizing the risks of marine pollution as a problem lurking behind their daily lives, not as a problem limited to disaster areas.

A precautionary principle refers to a system or idea that permits measures for controlling a possible serious or irreversible impact on the environment, even if a causal connection has not been fully scientifically proven.

III. Restoration of the fishery and seafood industry

[Key findings and discussion points]

1. A trend in each disaster area toward collaborations by utilizing various governmental subsidies for recovery, but most of these collaborations are treated as provisional measures until restoration.
2. In cases of collaboration on laver cultivation, some benefits such as enhanced habitats were found due to curtailed operational fishing grounds, improved fishing ground controls, and lower expenses and workloads, but some issues such as the difficulty for high capacity producers to exert their true capability were found.
3. In cases of small-size set net fishery collaboration, it was found that not only increased fish catches and cost savings due to changes in operation methods but also trends such as profitable purchasing being made possible by unified shipping lots, and exploration of new marketing strategies due to improved operational efficiency.

[Recommendations]

1. To making operations more efficient through collaboration
 - To consider various organizational sizes to suit the region and production structure, and consider organizing a permanent system of operational sharing.
 - To allocate cuts in cost and time to things such as resource management, fishing ground management, and create added value.
2. To promote correct fishing ground use and resource management
 - To arrange adequate cultivation facilities and establish operation plans for maintaining fishing ground environments improved by the disaster and marine product resources restored by suspension of fishing.
3. To create added value
 - To promote improved quality by practicing environmentally friendly fishing and cultivation, and promote the differentiation and branding of production areas.

[Who to implement the recommendations and their expected role]

Implementation will be led by the fisheries cooperatives and others in the fishery industry, but creating and expanding of new added value require the understanding and support of a wider range of stakeholders including government authorities, local residents, companies, NGOs and consumers.



Wakame seaweed gathering (Minamisanriku Town)

WWF Japan

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