



## Circle of Virtuous Cycle of U-net, registered organizations (As of 7/22/2014)

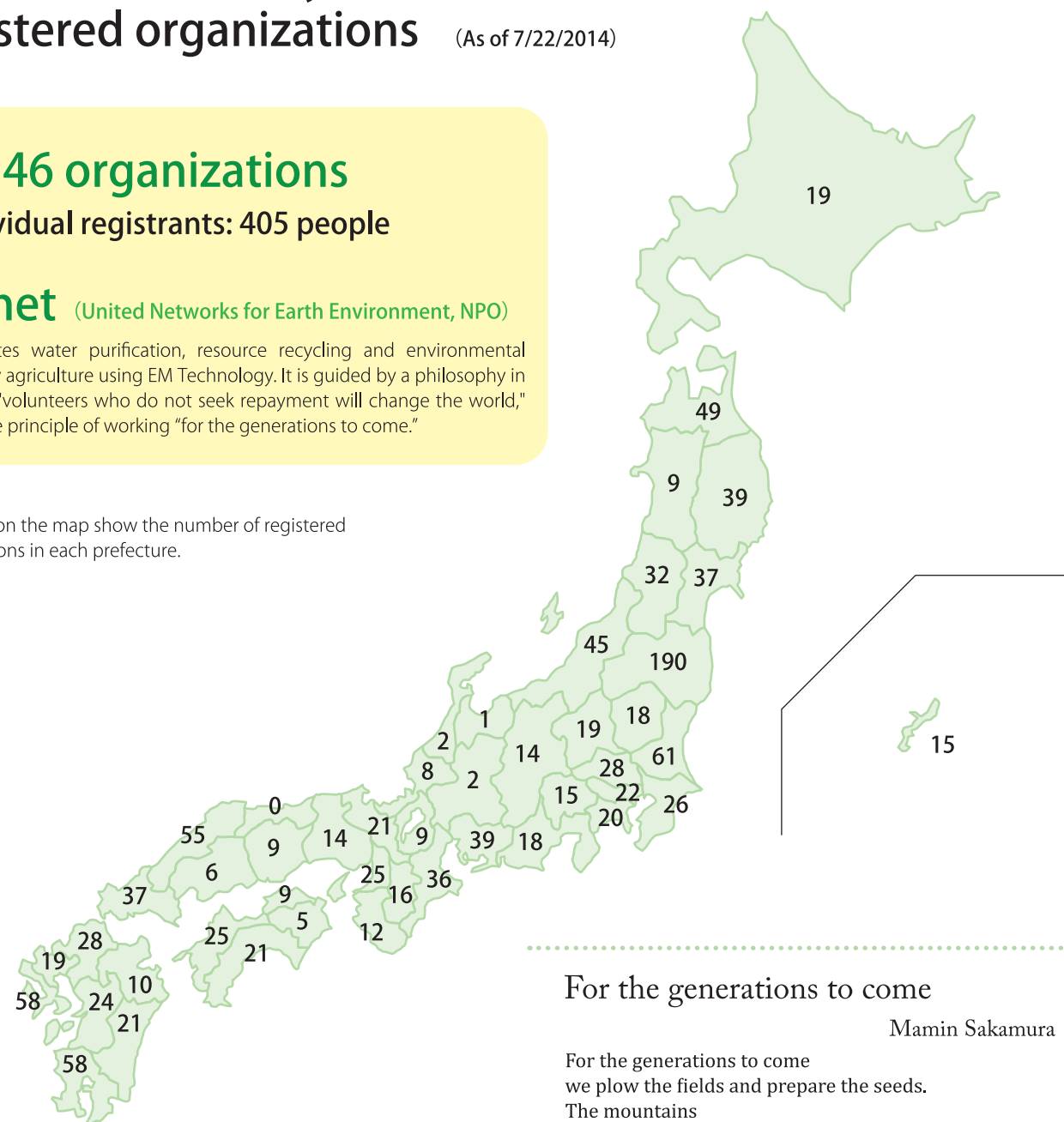
**1,246 organizations**

Individual registrants: 405 people

**U-net** (United Networks for Earth Environment, NPO)

promotes water purification, resource recycling and environmental friendly agriculture using EM Technology. It is guided by a philosophy in which "volunteers who do not seek repayment will change the world," and the principle of working "for the generations to come."

Numbers on the map show the number of registered organizations in each prefecture.



For the generations to come

Mamin Sakamura

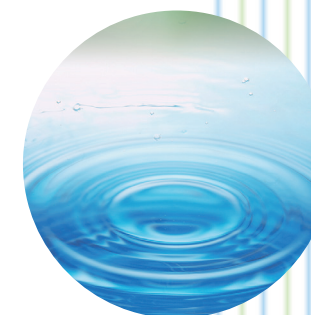
For the generations to come  
we plow the fields and prepare the seeds.  
The mountains  
the rivers  
the seas--  
all of these we keep clean.  
Yes!  
For the generations to come  
we work hard  
with patience.  
Everyone makes an effort.  
For the precious little children who come one after  
another,  
it is for them  
that each of us keeps on doing  
whatever we are able to.

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# Water System Improvement and Biodiversity Recovery

— Nihonbashi River purification, a 10-year history —

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Courtesy of United Networks for Earth Environment (U-net), a nonprofit organization



# The significance of the water system improvement

## Water (what connects the inorganic and organic)

The Earth is said to be a water planet, with 70% of the Earth's surface covered in water. This water moves through the oceans, some evaporates and becomes cloud, then becomes rain or snow to cover the surface of the earth. Water has become a major element that circulates around the globe to create climate. Also water is an essential medium for biologically stable metabolism, and is an important component for all living creatures. Water circulates around the land, sea, sky, and around the bodies of all living things, which means that through water all living beings are connected with the earth.

## A Desirable Water System

There are many indicators of the cleanliness of water. To summarize the conditions that we humans beings seek for water: 1. The water can be drunk, 2. Living creatures can safely inhabit it. These are the two conditions. From 2001 to 2005 the United Nations carried out the Millennium Ecosystem Assessment (aka: MA), referring to ecosystems that contribute to the well-being of humans as ecosystem services. These were classified into the following four types: 1. "Infrastructure services," meaning oxygen generation through photosynthesis; 2. "Supply services," referring to food and raw materials; 3. "Regulating services," including climate adjustment capability; 4. "Cultural services" that bring psychology fulfillment and recreation. We would like to further consider the benefits that the water system brings to us in these four areas.

### 1. Infrastructure services

The oxygen essential to our lives is not only created by trees in forests. A microorganism called cyanobacteria first generated oxygen in the Earth's atmosphere in the past. Wakame seaweed and kelp, familiar foods at our table, also photosynthesize. Rich seaweed beds, along with producing oxygen, also become the spawning grounds of small fish and serve as the foundation to foster biodiversity. The higher the biodiversity, the more buffering capacity there is with respect to changes in the natural environment, and this leads to stabilization of the supply service, which we discuss next.

### 2. Supply services

First of all water itself is a valuable resource for us. However, this is applicable only to freshwater regions. Second, the water system nurtures rich food resources. In Japan from ancient times seafood has been such a valuable source of protein that there is even a term for it, namely "blessings of the sea." It also provides the raw materials, such as coral, for ornaments, and contributes to future research by being the site for genetic resource protection.

### 3. Regulating services

As mentioned in the part on infrastructure service, organisms that perform photosynthesis in the water system recover carbon dioxide, which leads to the suppression of greenhouse gas. In addition, water systems in urban areas have been known to be effective in reducing so-called heat islands.

### 4. Cultural services

A beautiful water system itself has the power to heal the human mind. People are fascinated by the water system, not simply looking at the water, but because they can feel nature, including the living beings that dwell there. Through providing fishing, clamming, diving and myriad other leisure activities, the water system, with its rich biodiversity, helps people find relief from stress.

As is stated above, a desirable water system is valuable not simply for having clean water, but in the scenery and all the many varieties of small living creatures behind the scenes that support all the visible creatures; we hope it is clear how these are all woven into an ecosystem, thereby synergistically enhancing its value. However, not just in places where seawall construction has taken place, but in densely populated urban areas, there is a need for maintaining the current state of infrastructure through water control, a situation in conflict with the aim of restoring the ecosystem. Even in such a condition is it possible to revive an ideal water system? Next, we will introduce cases in which living creatures have returned to rivers in urban areas.

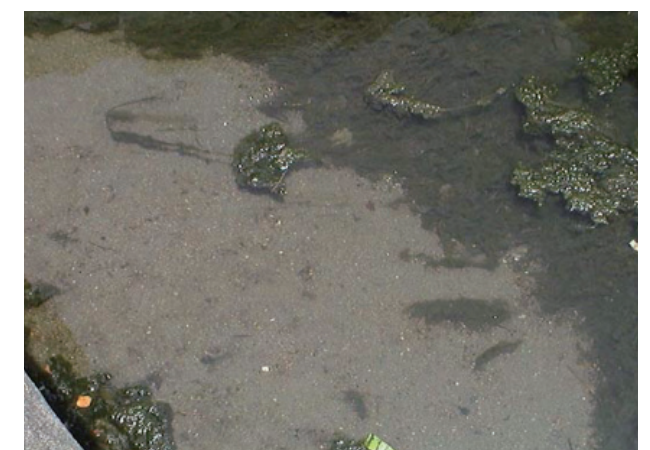
## A case study of reviving a water system: Asechi River (Yokkaichi City, Mie Prefecture)

Asechi Usui No. 2 main line, which is an approximately 5 km long river that flows through the center of the Yokkaichi City, is called by the local people Asechi River (hereinafter, referred to as "Asechi River"). Up to before World War II fireflies were seen near Asechi River, but with population growth pollution increased and sludge has gradually built up in the river. Complaints to city hall about the stench led to dredging of sludge every three to four years as a countermeasure, but this did not stop the progression of the pollution.

Local volunteers decided to try to clean the Asechi River on their own, and starting in 2000 began implanting the use of EM. One year from the start of their activities, they confirmed that the stench was alleviated and the sludge had decreased. The local residents' association was impressed by this result and they started to cooperate in using EM. Gradually the circle of this activity grew, residents and businesses along Asechi River also participated, and this led to community-wide activities. As the activities increased so too did the results, and now clean sand is visible between the aquatic plants that grow in the riverbed.



Asechi River, before EM was applied



Sand that appeared in the riverbed



Five years from the start of this activity fish have returned to the river, and local people released colored carp into the water and enjoy watching them now.



In 2008, eight years after the activities began, Ayu (sweetfish) also been identified swimming upriver, and this has been widely reported in the local media. Ayu (sweetfish) that were caught.



Voice of the former mayor of Yokkaichi city, Mie Prefecture

Asechi River flows through the very center of the city, and nearby residents often complained loudly about it. In the summer, people complained that, "It stinks!" If you go toward to estuary, there are indeed mountains of sludge. People begged that we do something about it. We got rid of the sludge at a cost of 20-30 million yen every three or four years. However, I wondered whether we should use our tax money to do that.

In 2000, as I recall, I wondered whether we could clean up the river introducing EM Mudballs. Then, the municipal government would no longer need to spend a tremendous amount of money just to get rid of the sludge. Will it really work? I wondered, and thought that we won't know until we actually try it. Volunteers asked me to let them do it on their own, and told me that definitely the conditions in the river would improve. So we asked them to go ahead. The most surprising thing is that the Japanese government requires the most money and authority to take care of the rivers, but those kinds of actions and national undertakings were done through the power of local citizens. This is simply revolutionary. At first, this was done by volunteers, but after a couple of years members of the local resident's association thought, "This looks very likely to succeed" and they also wanted to help. Two or three years after that, the city started to think they needed to be part of this, and seriously got involved. So support for the volunteers steadily began to swell. Also, the results are quite visible. This would be a truly great project. Far from citizens' activities and administrative and bureau business expansion moving in opposite directions, we see them moving in the same direction, doubling and tripling the effectiveness. We call this "collaboration" and I want us to focus on this. This case is the most stunning example of the success of such joint efforts.

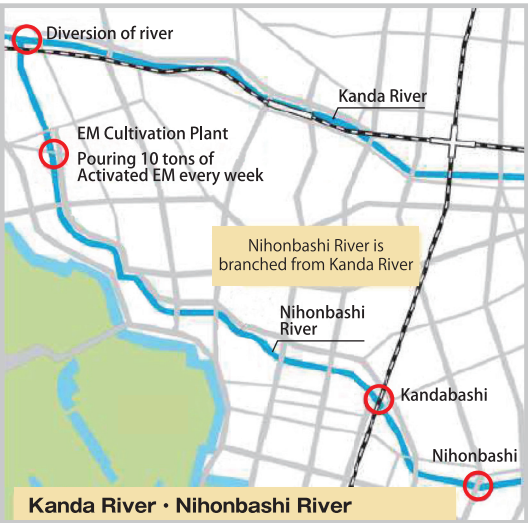
※ Here we introduce the tape transcription of an interview with Mr. Tetsuo Inoue, who was mayor of Yokkaichi city in 2008, about the restoration project in Asechi River at that time.



From Chunichi Newspaper on October 22, 2008  
An article about Ayu fish coming back to Asachi River

Nihonbashi River water system improvement efforts by citizens in Tokyo

Nihonbashi River, which separates from the Kanda River near JR Suidobashi station, is a first-grade river of 4.8km in length that flows into the Sumida River. The river was dug in the early Edo period, and the river was the main line of logistics to support the city of Edo. After World War II, although people still could swim in the river, during the period of high economic growth it steadily grew polluted. Further, after it was covered by a highway, it became less a part of people's daily lives. The original starting point of Japan's road system, the landscape of "Nihonbashi" is severely hampered by the highway. People are proceeding with a plan to recover the blue sky over Nihonbashi by dismantling the overpass.



The Background of the Nihonbashi River water system improvement project using EM

Hoping that when the blue sky returned to Nihonbashi the Nihonbashi River would once again be a clear-running river, people began their efforts to improve the water system under the slogan "Revive the Nihonbashi River!" By then the use of EM had been successful in cleaning the Asechi River, and organizations such as the Historic Bridge "Nihonbashi" Preservation Society, and the not for profit organization Bring Back Clean Water in Nihonbashi River-Kanda River, have implemented this activity utilizing EM along the Nihonbashi River with the cooperation of companies and civil organizations.

In July 2005, they threw 3,000 EM Mudballs into the river in a project to clean the Nihonbashi River. Since then, they have regularly introduced EM Mudballs into the river. In December 2006, a plant that manufacture EM was completed in Nishi-Kanda in Chiyoda-ku.

The plant has the capacity to culture 10 tons of Activated EM and since then they have been applying 10 tons of Activated EM every week. Further, since the water of the Imperial Palace outer moat overflows into the Nihonbashi River, the groups began applying Activated EM and EM Mudballs to the Ushigome moat near JR Iidabashi Station from July 2007, and they are continuing this activity now. So far the total amount of Activated EM and EM Mudballs which have been used in the Nihonbashi River and Ushigome Moat is shown in table on the right.



|                  | Activated EM | EM Mudball |
|------------------|--------------|------------|
| Nihonbashi River | 3,218t       | 171,000    |
| Outer moat       | 668t         | 185,000    |
| Total            | 3,886t       | 356,000    |

As of July 2014





## Supporting Partnership

### Organization of purification project

In June 2006, three organizations: the Historic Bridge "Nihonbashi" Preservation Society, the Nihonbashi Corporation Association, and the Nihonbashi Rotary Club decided to implement a project to clean up Nihonbashi River with technical support from U-net (United Networks for Earth Environment, NPO), and looked for a location to install Activated EM production equipment. However, there were not suitable sites along the Nihonbashi River in Chuo-ku, and they had an offer from Chiyoda-ku. Chiyoda-ku decided to rent a place where the 20 town councils and corporate wards founded the "Revive Clean Water in Nihonbashi River and Kanda River Group" and here they started the construction of an Activated EM production facility in September, 2006 and it was completed in December of the same year. We had a grand facility completion ceremony with Mr. Ishikawa, head of Chiyoda-ku, Mr. Yata, the head of Chuo-ku, and all the members of each organization. Currently, this purification project of the Nihonbashi River and Kanda River has been carried out by us, U-net, NPO and four other organizations below under the sponsorship of Chiyoda-ku and Chuo-ku. As a special sponsor OTSUKA CORPORATION and Merrill Lynch Japan Securities Co., Ltd. have also participated.

### Participating Organizations

#### Historic Bridge "Nihonbashi" Preservation Society

This association was established in May 1968, triggered by the fact that the Metropolitan Expressway had severely hampered the landscape of Nihonbashi. The Society was founded to preserve for future generations the symbol of Edo prosperity, "Nihonbashi," and with the hope for overall development of the Nihonbashi area. Since then they have continued to wash the bridge every year; this year marks the 38th year. The Nihonbashi area is going through large-scale redevelopment in recent years, but the area is eager to preserve traditional culture and beautify the environment. This Nihonbashi Preservation society has been active as the main organization in these efforts.

#### Nihonbashi Corporation Association

Nihonbashi Corporation Association was founded in 1953 and became an incorporated association in 1974. Since then it has conducted a variety of activities as a public benefit corporation. The current membership is about 6,000, and it holds a variety of workshops and lectures for members. They also focus on activities that contribute to society, and have proposed panel discussions on environmental issues, revitalization and tourism in Nihonbashi area, they have been very active in cooperating in the project to clean up the Nihonbashi River.

#### Nihonbashi Rotary Club

Nihonbashi Rotary Club was founded by long-established store and company owners of the Nihonbashi district in 1958 and currently about 174 people are enrolled. The Rotary Club serves the local community, and about 1.2 million business, professional and local community leaders worldwide practice humanitarian service, and promote goodwill and peace in local communities. In the Nihonbashi area, there are three other clubs as well- Tokyo Nihonbashi East, Nihonbashi west, and Tokyo City-and they all have carried out similar activities and participated in the purification of the Nihonbashi River.

#### "Revive Clean Water in Nihonbashi River and Kanda River Group"

This group was established in 2006 with the goal of reviving the Nihonbashi River and Kanda River so they can be "rivers you can enjoy fishing in." This year, they applied to become a not-for-profit corporation and this application is pending. They are reviewing their town from the point of view of town planning, reconfirming the interest local people have in their two rivers and how the town can be viewed. They are making efforts to clean up the Nihonbashi River and Kanda River in Chiyoda-ku, putting in EM Bokashi fermented mud balls, and conducting other related activities. They have already put about 55,000 EM Bokashi fermented mud balls into the Nihonbashi River and about 65,000 balls into the Ushigome moat.



The Historic Bridge "Nihonbashi" Preservation Society. Throwing EM Mudballs into the river at the annual "Nihonbashi" cleanup event.



Under the slogan of "Bringing back Salmon to Tokyo Bay", releasing salmon fry into the Nihonbashi River, an activity that began in 2012.

## Reviving Tokyo Bay so that the seawater is abundant and clean, and people are able to swim in it.

### Teruo Higa

Director, U-Net  
Professor emeritus, University of the Ryukyus  
Director, International EM Technology Center

EM is used in purification of the ocean, rivers and lakes, and is the most utilized microbial material in the world in aquaculture that does not use antibiotics. The effect is due to the overall strength of the antioxidant effects and non-ionizing action caused by the increase of EM, the rectification and detoxification of harmful energy, and the conversion of this to useful energy. EM is, in the United States and Germany, sold as a live culture health drink, its safety certified by official institutions throughout the world. EM ferments and decomposes organic matter that becomes the cause of sludge, creating food for zooplankton and phytoplankton, and at the same time it enriches the foundation of the food chain, and significantly suppresses the E. coli that uses putrefactive organic material as food. Mikawa Bay in Aichi Prefecture, is a brilliantly achieved case using this EM Technology with the help of volunteers. Mikawa Bay was once the most polluted in Japan and was badly devastated situation, but it has become clean from the time of the Aichi Expo, and finless porpoises (small dolphins), which were feared to be on the road to extinction, also recovered and are multiplying. Now more fish are caught in Mikawa Bay than any other bay in Japan. In addition people are able to swim now at beaches that had been closed. A large amount of sweetfish, too, are found swimming upstream into the three rivers that flow into Mikawa Bay, and this activity has spread not only to Ise Bay but throughout the country.

With this background, with the cooperation of a large number of people, EM has been applied upstream of the Nihonbashi River continually since 2006. As a result, in a few years bad smells in the Nihonbashi River, Kanda River and Sumida River all disappeared, the water is filled with active fish, and even Tokyo Bay has recently become quite clean. Lots of people enjoy clamming during spring tide in Tokyo Bay. Sweetfish are back in groups in all of the rivers that flow into the Tokyo Bay. People can now swim in beaches in Edogawa-ku and Minato-ku and children are enjoying splashing and playing there. NHK has reported that Edo-style fisheries have revived and Tokyo Bay is now clean. The miracle that happened in the Mikawa Bay is now happening in Tokyo Bay, too. If this continues, in a few years, at the latest by the time of the Tokyo Olympics, the Edo-style fishing grounds will become even more abundant, and we believe that people will be able to swim anywhere in Tokyo Bay.

## What is EM ?

EM, which contains lactic acid bacteria, yeast, and phototrophic bacteria as the main components, is a versatile microbial material of safe and useful microorganisms coexisting. It was originally developed as a technology using microorganisms to establish an agricultural technology that does not rely on chemicals, that activates the microorganisms that are the foundation of the ecosystem, and it has been confirmed that it is effective in converting sources of contamination to useful resources. Through this action, when you put it in dirty water it decomposes sludge, and is effective in restoring aquatic plants, shellfish, and small fish.



### Activated EM

EM is a living microbial material, and proliferates and becomes more active when given food, including sugar. In this way the liquid in which EM proliferates is called activated EM, and applying it in the field in an activated state enhances the effectiveness of EM.



### EM Mudballs

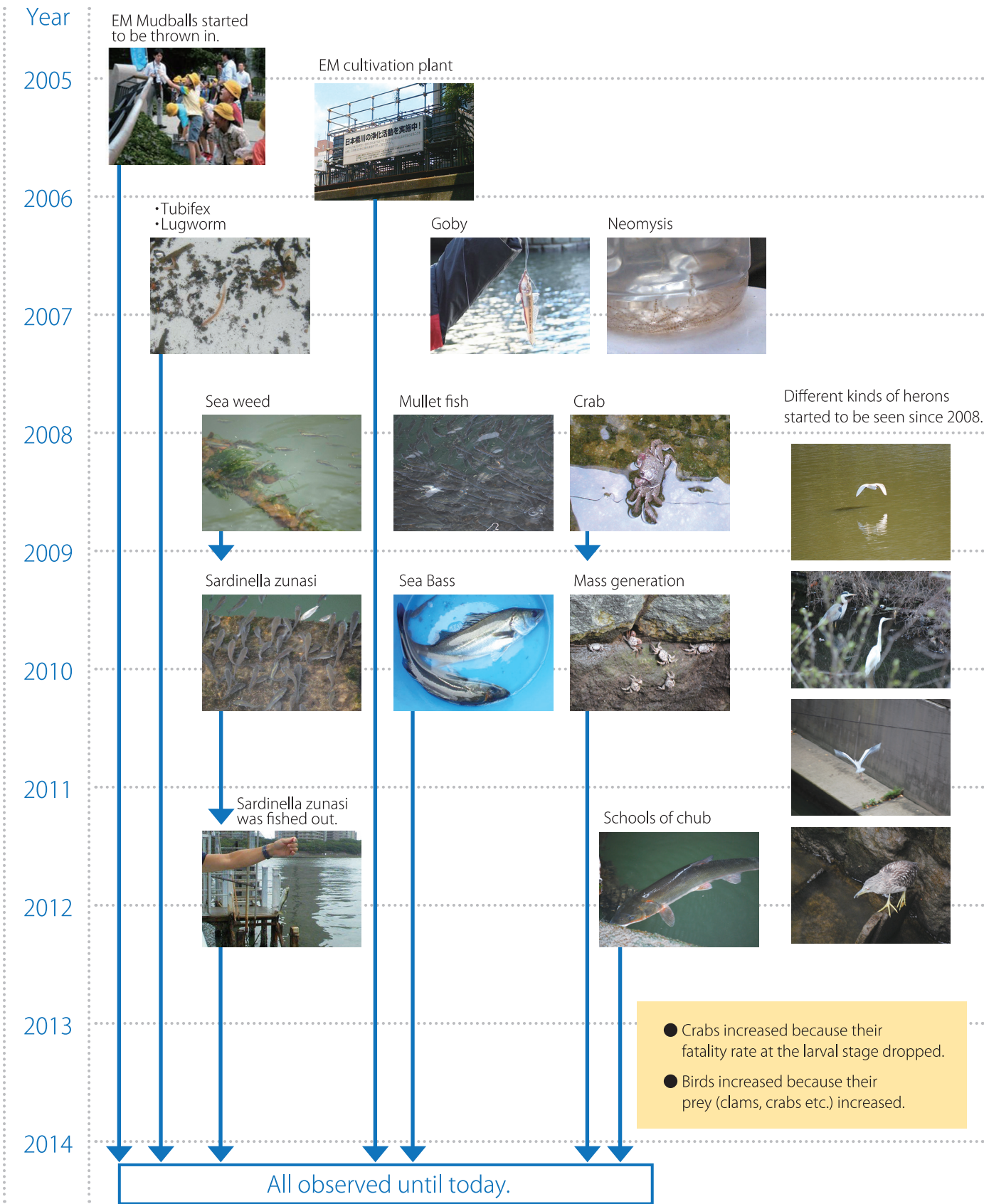
This is a fermented material that is grown by mixing EM with the soil and rice bran. Mold makes it very hard and firm (the same principle as dried bonito), and it remains on the bottom of the contaminated water and emits a sustained cleaning action.



# Changes in biodiversity recovery of Nihonbashi River

(through observation and interviews)

Although there were originally a variety of living things in the Nihonbashi River, since most of the water source is sewage treatment water, depending on the weather, the water quality is not stable and the opportunity and living creatures were rarely encountered. In the wake of applying EM to the Nihonbashi River, we began our own study of the river, which is still ongoing. According to this study, we found that the frequency of encountering living creatures in the Nihonbashi River has increased, and that the variety has also grown.



## Confirmed the effectiveness of EM through the increase in Ayu, sweetfish, heading upstream

Comments by Mr. Kenji Niikura,  
Director of the Miuraya Houseboat Company.



In the 1960s no one here paid much attention to the river. But there were still living creatures in the river, even more than now. They lived vigorously in the contaminated water and mud. However, in recent years, the water definitely became cleaner because of the improvement in the sewage water system, but we no longer saw living creatures in the river. The water surely became clean but it does not help living creatures if they cannot to live in that clean water. The past few years, what I have been particularly concerned with is the reservoir of Highway Route 7 (official name "Kanda River Highway Route 7 Underground Detention Pond"). Naturally I do not object to the presence of the facility itself, because we must give first priority to what is needed for human life. However, when water from the reservoir is released, the rivers on this side become extremely contaminated. Recently they seem to be more careful about discharging, but I think that they can be a little more considerate. I have experienced myself the effects of applying EM. I feel that the odor has been reduced, and large, island-like scum is recently no longer seen. I heard that the run-up of sweetfish has also been seen in Nihonbashi River. To bring back the biologically rich river as before, I believe that it is necessary to consider tidelands. We need a livable environment for water creatures in this bottom sediment, otherwise the ecosystems will not recover diversity. Previously by the riverside were built to face away from the river, but these days they have changed their structure to enjoy the scenery of the river. It's a good thing that many people have started to show an interest in the Kanda River and Nihonbashi River, and I will be very glad when the environment improves even more, and more people will come down to the waterside. As more people pay attention to the river I hope their awareness of the need to clean it up will increase.

\*Miuraya has regularly cooperated with us in biological research and surveys on the bottom sediment in the river.  
Mr. Niikura serves as a union representative director of the Central Sumida Fishery Cooperatives.

## The severed food chain has revived, and there is steady progress in recovering the ecosystem

Comments by Mr. Hoshino,  
Technical staff, U-net  
(United Networks for Earth Environment, NPO)



Because of structural conditions common in the rivers of the city center, and because of our lifestyle in recent years that intensively uses chemicals, the Nihonbashi River is too harsh an environment for living creatures to inhabit. However, since we started to use EM we have seen dragonflies from the second year. Larval dragonfly nymph of the dragonfly eat tubifex, so we believe there has been a change in the sediment of the river. The kinds of the creatures which we can observe with the naked eye have increased every year. The food chain, which seemed to have been cut off, has been brought back. EM, which was applied in the Nihonbashi River, is also affecting Tokyo Bay, and as reported in various media aquatic plants and algae field have revived, and the self-cleaning actions of living things has returned. To support this, the rising tide from Tokyo Bay that affects the Nomi River, the Meguro River and the Tsurumi River, has no bad odor now, and we confirmed that sweetfish are naturally migrating upstream. The past few years we no longer have witnessed the mass death of fish. Also compared to previous years, there have been many more opportunities to see birds, including herons. Because herons prey on small fish, crabs, and shellfish, this indicates that living creatures in the Nihonbashi River and the outer moat have grown more abundant. If we consider what these visible creatures are using for food, we can understand that the ecosystem of the Nihonbashi River and Tokyo Bay is recovering more than we can imagine, and that these phenomena match, in terms of the time period, the use of EM.



# The water purification activity of the Nihonbashi River and Kanda River led to purification of the moat

In July 2005, at the 35th Cleaning Nihonbashi Bridge event, local residents began using EM soap and throwing EM Mudballs into the river as part of the water purification activities. The next year in December, with the cooperation of the district administration, the EM culturing apparatus was completed near Horitome Bridge in Chiyoda-ku, Nishi Kanda, and began to apply 10 tons of activated EM every week into the Nihonbashi River. These activities expanded from the purification of the Nihonbashi River to the area upstream in the Kanda River, and cleanup activities in the outer moat, and have resulted in a remarkable recovery of the ecosystem. This time, in activities have been organized around the neighborhood association in Chiyoda-ku, the “Group to revive the clear stream in the Nihonbashi River and Kanda River” (Mr. Isamu Hayashi, chairman), we here introduce some of the water purification activities conducted by residents in the central part of Tokyo.



The Edo Castle outer moat and Ushigome moat, where the surface of the water is beautiful. 20,000 to 30,000 EM Bokashi fermented mudballs have been applied every year.

## What is the source of the scum outbreak of the sludge?



The chairperson, Mr. Isamu Hayashi, speaking kindly to local elementary school children who participated in EM Bokashi fermented mudball project (center).

With cooperation by the Historical Bridge, “Nihonbashi” Preservation Society the preparatory committee of this association started throwing EM Mudballs into the New Misaki Bridge of the upper Nihonbashi River in January, 2006. In August of the same year, they established an association called, “Revive a clear stream in the Nihonbashi River” (later they changed the name, adding Kanda River to it.) In 2006 this group applied a total of 11,000 EM Mudballs into the Nihonbashi River, and as mentioned above from December of the same year began applying 10 tons of activated EM every week. With such aggressive expansion of water purification activities, worms, and benthic living things such as tubifex appeared, and the stench of the river has steadily been eliminated. However, when the water temperature rises, sludge scum peels off from the bottom of the water. We traced the scum outbreak sources of the sludge and found that the scum which occurred in the outer moat is flowing into Nihonbashi River via the Kanda River. Right away we started working to cleanup the source of the outbreak, the outer moat.

## Purification of the Moat with EM Bokashi Fermented Mudballs and Activated EM

In 2007, this Association started introducing EM Mudballs in the Ushigome moat (at Iidabashi), which is located at the most downstream of the three outer moats that are the source of scum. They have continued putting in a large number of EM Mudballs in the moat, a total of 36,000 Mudballs over four times in the same year, a total of 30,000 Mudballs in 2008, 20,000 in 2009, and 20,000 in 2010. (For more detail information, please visit their website). These activities have kept expanding as a big circle of volunteers joined, such as not-for-profit environmental related organizations in the Kanto area, college students from local universities, local company employees of Chiyoda-ku, in addition to the members of this association. In June, 2008 this association also started to input 2 tons of activated EM every week, divided from the 10 tons of EM culturing apparatus at Nishi-Kanda, to the Ichigaya moat to purifying the moat. Located in the most upstream location of the three outer moats, during heavy rain the domestic wastewater flows out and causes terrible water pollution.

## Fostering a new traditional culture through improving the quality of the water in moats and rivers

### The river purification activity “Bridge caravan” is established as an ongoing annual event in local elementary schools

The Revive the Clear Stream in Nihonbashi River and Kanda River Association, in cooperation with the government of Chiyoda-ku, started the river cleanup activity, the “Bridge Caravan” in June 2008, which is a cleanup activity for the children of each of the local elementary schools and it has become established as an annual event.



Aiai Bridge: Fujimidai Elementary school children are throwing in EM Bokashi fermented mudballs in the stream.

Bridge Caravan was planned with the hope that local children to get more familiar with the bridges over the Kanda River and Nihonbashi River and the rivers themselves through their experiences participating in the cleanup activity. We also hope they will learn more about the history of the rivers and the bridges that the Bridge Caravan is involved with and to encourage them to nurture this new local tradition. This Caravan is involved with Edo Bridge, Yoroi Bridge, Shohei Bridge and other bridges, and many of these are quite historic. So far many EM Bokashi fermented mudballs have been prepared and tossed into the rivers by their cute little hands to help purify the rivers. Some children did not even notice that the Nihonbashi River and the Kanda River existed, but through this experience of participating in the Caravan they now look down at the water past the vertical concrete overpasses and say, “I wonder if the water has gotten cleaner?” and “I wonder if the number of fish has increased?”

## Enjoying the view from the surface of the water and Eco-boats appeared in Chiyoda-ku

Mr. Minoru Otsuka, special advisor or the Association, honorary chairman of the Otsuka Corporation, a company is located by the Nihonbashi River, was looking at the foul-smelling river from his office and was wondering whether this situation could be improved somehow. He has played a major role in terms of both material and spiritual support in both starting the Association and in the water purification activities of the Association. In addition, as the water purification activities have gotten on track, he has donated two battery-powered Eco-boats to Chiyoda district. He said that he has a desire that local people and children can enjoy the scenery of the rivers and become interested in maintaining the rivers and enhancing the landscape. Thanks to his goodwill, these boats have helped the Nihonbashi River and Kanda River water quality improvement project and in creating beautiful scenery, and we hope this “tradition of boating to protect the environment” will continue in central part of Tokyo.



Mr. Minoru Otsuka, special adviser (on the right,) whose lifework is reviving beautiful nature and scenery



The fireflies in the habitat of the Canal Café

## Fireflies inhabit the floating island of Canal Café Progress in water purification, enjoying seeing fireflies two years in a row



Ms. Yuko Hanyu, owner of the Canal Café realized a revival of fireflies

The outer moat of Edo Castle in this district is made up of three moats, the Ichigaya moat, the furthest upstream, the Shin Mitsuke moat, and Ushigome moat, the furthest downstream. Treated water from the sewage treatment plant has been flowing into the Ichigaya moat. As mentioned above, during heavy rain, because the domestic sewage is discharged untreated, the pollution is severe, with a stench hanging over the moats. Because EM Mudballs have been put into the streams since July, 2007, and activated EM has been applied since June, 2008, there has been a steady improvement in water quality. Ms. Yuko Hanyu, owner of the Canal Café in Ushigome moat, pays tribute to the water quality improvement activities by the Association to revive the clear stream in the Nihonbashi River and Kanda River, and herself is an active participant in the Association’s water purification activities. In 2008, she was convinced that the water quality in the moat was improving and decided to begin a “revival of fireflies,” a long-cherished desire of hers. In the summer 2009, a single firefly was seen in a floating island made in restaurant, and this was featured in the media. Since 2010, during the period from mid-June to July, people could enjoy watching fireflies. (For more information, visit Canal Cafe website). It has been introduced in the Chinzan-so Hotel, as restaurants where people can enjoy watching the fireflies in Tokyo.

## Bottom of the moat is visible, with shrimp swimming in the water

In early May of 2010, the bottom of the river near the café pier was clearly visible for the first shrimp were observed swimming. The owner, Ms. Hanyu, and her staff members’ eyes welled. An excited chef scooped up the shrimp and made shrimp tempura to taste it.

## Appealing to her customers to participate in the environmental cleanup activities

At this restaurant, they sell fish food for the carp and eco-bags in the store, trying to get customers interested in water purification and environmental issues, and they donate the proceeds to environmental activist groups. Already 15,000 people or more have supported these activities.



Eco collection box: All proceeds from the sale of fish food for the carp and eco bags, goes to environmental cleanup groups.



# The mechanism of reviving the water and restoring the ecosystem by using EM

## Developer of EM and Doctor of Agriculture Professor Teruo Higa

Dr. Teruo Higa, born in Okinawa Prefecture in 1941. The developer of EM™. Head of the International Institute of EM Technology at Meio University. Professor Emeritus of the University of the Ryukyus. Chairman of Asia Pacific Natural Agriculture Network (APNAN), the Chairman of International Nature Farming Research Center (INFRC), Chairman of the Non profit organization, United Networks for Earth Environment (U-net), Chairman of the Evaluation Committee for the National Flower Contest in City Development and Construction (a project sponsored by Japan's Ministry of Agriculture, Forestry and Fisheries and Ministry of Land, Infrastructure and Transport). Major publications: An Earth Saving Revolution, Our Future Reborn and A New Earth Saving Revolution (Sun Mark Publishing), An EM Environmental Revolution for the New Century (Sogo Unicom Publishing), Use of Microorganisms in Agriculture & Environmental Protection (Nobunkyo Publishing) and many others.



## Using EM in water purification: the point is to consider the time axis

I am asked many kinds of questions by people, for instance, “How much EM do we need to use to cleanup polluted rivers and ponds? How long will it take them to be cleaned?” or “Why can EM help to enrich nature and increase the numbers of fish and other creatures and keep the diversity of living things? We would like to know about the mechanisms involved.” However, there are not such simple answers to those questions because many overlapping complex factors are involved in those questions. To exaggerate a bit, a river that was polluted over a period of 30 years takes 30 years to be cleaned. In short, it takes as much time to clean as it took to pollute it. This is just common sense.

Therefore, there are people who complain that EM could not clean the polluted water immediately after they used it. They don't understand the time axis, that it takes a long time for water to become clean or dirty in the natural world. Generally speaking water purification mean, making transparent water through filtration, or to making clear water using chemical treatment in a short period of time. There is of course also pollution caused by chemical substances, but there is little awareness of water pollution caused by the creatures in the water. In short, we view the phenomenon of pollution with the idea that a breakthrough artificial method can clean up water.

## Water system also has a process of fermentation decomposition, just like soil does

The amount of dissolved oxygen in water is around 5%, in an environment low in oxygen. If organic matter gets in these conditions it starts decomposition by aerobic microorganisms and immediately faces an oxygen deficiency. Eventually harmful fermentation decomposition by anaerobic microorganisms will occur.

As a result, methane gas and hydrogen sulfide will occur, as well ammonia and reduced substances such mercaptan, and foul odor will be emitted. Fermentation decomposition is a process in which microorganisms continue to break down organic matter where there is little oxygen, and in general this will be harmful putrefactive decomposition. Substances produced by putrefactive decomposition introduce both a foul stench and intense active oxygen. Therefore, every object is degraded and it creates conditions in which ordinary living things cannot survive. Compared to the aerobic oxidation, the speed of fermentation decomposition is fairly slow, about 1/20th, and lot of organic matter in the water will remain. When the contamination by organic matter accumulates because of sewage as well as domestic waste water, without being decomposed, it will remain as septic matter and becomes sludge. If chemical pollution is added, fish and shellfish die out, and waterweed withers and dies. As it gets dirty, more garbage is discarded and organic matter will steadily accumulate, with the end result that lakes, marshes and ponds which were once clean become land. This is why in Southeast Asia and elsewhere, many dams in various places have become dry land. Hydrogen sulfide and methane gas or the like accumulates near the bottom, producing an unbearable stench.

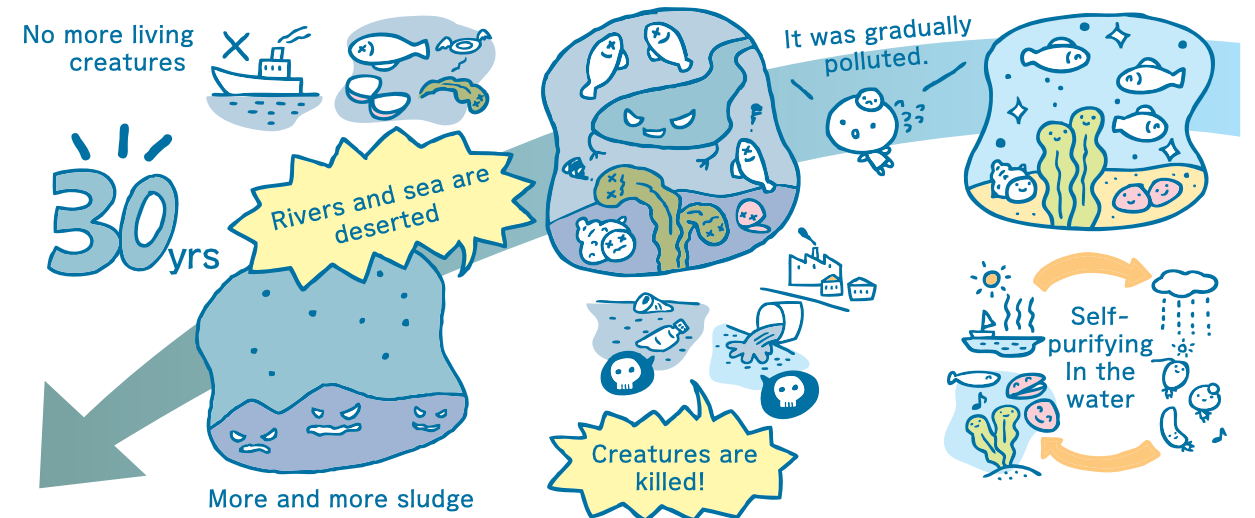
As a way to prevent this, in general, is to force in air, or aeration to produce oxidative decomposition, or else conduct dredging of the sludge. These methods are smelly and costly. Also in aeration, because it does not have the same oxygen as normal air, no matter how efficiently it is carried out, it is impossible to increase the dissolved oxygen to higher than 7%. It might work in a smaller scale, but when the scale is large, dealing with this problem is difficult, and will mostly end in failure.

Along with being strong alkalines, methane gas, hydrogen and ammonia also induce intense oxidation. In poor oxygen conditions, in such a situation the environment will be uninhabitable except for special organisms. In short, only microorganisms that can withstand intense oxidation or intense alkalinity, can survive there.

Generally, that is why when the water becomes polluted organisms cannot live in it. This is a result of population increase, and a lifestyle in which increased sewage and garbage and large quantities of organic waste are thrown into rivers and the bottom of the water.

In an attempt to support this in a sanitary manner, a variety of chemicals are used to reduce the harmful microorganisms. Then in turn, when chlorinated water flows in, no organisms can survive. In short, the desertification phenomenon of rivers and seas occurs, destroying the ecosystem, and resulting in greatly reduced biodiversity. Natural resources are significantly reduced, and there is an especially serious impact on fisheries. At the same time serious water pollution is caused by chemical substances, including synthetic detergents.

## 【 How water environment get polluted】



## Purification by EM focuses on biological diversity and transforming foul odors

Well, then, people ask “What happens when I start to use EM?” For example, if you put EM in the toilet bowl in your home it will suppress odors from ammonia, hydrogen sulfide, methane gas etc. within a few minutes. This means it is working to neutralize them with the organic acid of EM. This is thoroughly at the level of neutralization, but in the case of EM these odors do not just temporarily disappear, but will not appear again. This is because phototrophic bacteria, which is the main bacteria in EM, separates the hydrogen from reducing substance that are causing the odor and use it for photosynthesis. After that the deodorizing effect continues. However, if the odor again appears it means that the amount of EM being used is not enough. Presence or absence of a re-occurrence of this smell is the first criterion in deciding whether or not the effect of EM have appeared. So, first, if you put EM in the rivers, ponds and gutters, do not expect the water to suddenly turn clean like the water in a swimming pool; instead make sure to observe the presence or absence of odor and occurrence of earthworms and water fleas, etc., all the aquatic living things. If it took thirty years to pollute rivers, marches, ponds, etc., and you clean them in ten years, that means it's three times faster, which is an amazing thing.

The point in water purification is to put aside the superficial water pollution, and see whether the odor is gone. This is the first step in determining the effects of EM. Beyond the odor of the water, if a smell comes out from the sludge in the bottom when you move it, that means you need to use more EM. Normally, using Activated EM one ten-thousandth of water means you're for a long battle. However, if you want to have effects over a shorter period of time, then we normally use a combination of EM Mudballs and Activated EM one thousandth of water.

In the end, we determine things by the degree of pollution of the location, the amount of EM used, and whether EM has colonized and spread, and worked effectively. The point is to “use EM till it works!”

However, depending on the state of the sludge that has accumulated in the bottom, even if purification advanced more and more, it will still appear polluted and seem that the situation has not improved. This is because various changes are happening in the process of purification. To repeat, we determine things by the degree of pollution of the location, the amount of EM used, and whether EM has colonized and spread, and worked effectively. The point is “Use EM till it works!”

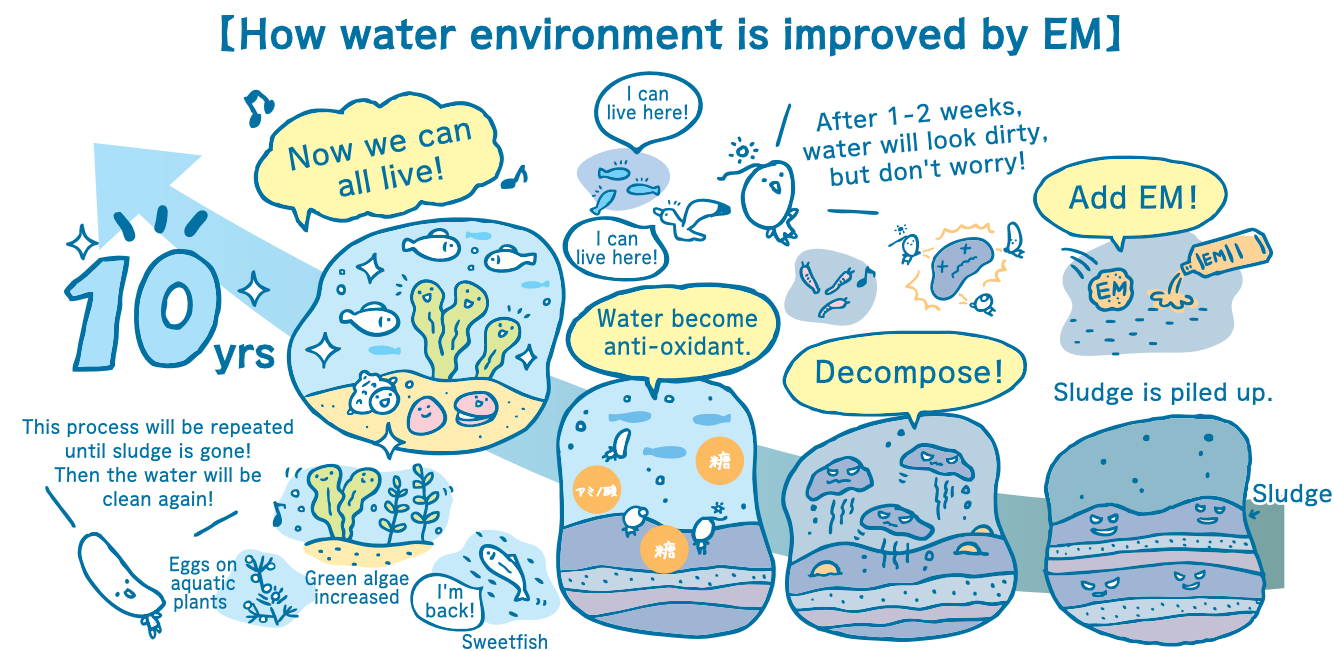


## When the fermentation decomposition occurs, water may temporarily turn dirty, but this is a passing phenomenon!

When the fermentation decomposition by EM starts gases such as carbon dioxide, oxygen and hydrogen are generated. When these gases are generated, organic matter which is stuck to the surface along with the gas is lifted up and floats. This is a good sign, something to be happy about, even though it appears dirty and if you check the E. coli you'll find the numbers have increased tremendously. This does not mean an increase in E. coli, rather that the E. coli in the organic matter was brought into the open and is floating in the water.

Since this phenomenon occurs in about one to two weeks after first applying EM, one might draw the conclusion, based only on data during this period, that EM pollutes the water and increases E. coli. However, the function of EM has to go through a series of processes as a biological phenomenon, otherwise the contamination will not disappear. Once the dirty state settled down in about two weeks and becomes clean, and lasts for about one to two weeks, then after a while the same kind of phenomenon will occur again from the bottom. Why does this happen? It is because organic matter gradually accumulates where there is stagnation in swamps and rivers, and does not accumulate at one time. Heavy rain comes, it accumulates, again heavy rain comes, this is repeated, and each time it accumulates there it will be a microbial film that forms a layer. When the organic matter is decomposed, it decomposes by layers. So, when the microbial film peels off it floats up, then when it becomes clean the next accumulated layer will float. So, depending on how many layers there are, there will be a repeated process of the water being dirty or clean, which will continue until the putrefactive organic matter on the bottom disappears, and at last, it will be sustainably clean.

Using EM, because the fermentation decomposes the sludge, this results in amino acids and organic acids, and further the cellulose and lignin in these are changed into such things as sugar. These organic nutrients will increase the variety of zooplankton and phytoplankton in the water, and some of which is supplied to food for shellfish and protozoa. Also in the decomposition, if there is ammonia and methane gas, phototrophic bacteria uses this to make amino acids and sugars, and the amino acids and sugars create an anti-oxidation state that suppresses E. coli. Therefore there is an increased number of a wide variety of zooplankton and phytoplankton, which will enrich the foundation of the food chain.



## Method to determine river purity

Since the volunteers ask me how to determine this, I replied, "Draw some water and if it smells bad, then it is not good." Leave the drawn water for a couple of days, and if it smells bad, then it is not good. If it becomes cleaner as the number of days goes by, then it is in perfect condition. It may appear dirty, but actually it has already become cleaner. Or make flower arrangement with stick green plants in the water; if the water is still contaminated the submerged part will soon get rotten. If the water is clean enough, then the stems of flowers and greens would rot. You can check it in such a simple way.

## Column

### Comparison of the water quality of the Nihonbashi River and the Kanda River

Professor Higa himself tried the method of determining the water quality written in the previous page using some chrysanthemum flowers. Using the water of the river right beneath Nihonbashi bridge and the water of Kanda River near the Kanda Employment Security Office where there seems to be little influence of EM application, he put a stem of chrysanthemum in each bottle, and as you can see in this picture ten days later there is a distinct difference between them. In the bottom sediment survey, the bottom sediments in the vicinity of Nihonbashi smell less, while the water in Kanda River from the front of the Kanda Employment Security Office has a strong odor.



Nihonbashi River

Kanda River

## EM has become the base of the food chain, and adjusts the balance of the ecosystem

The work of microorganisms is not just to decompose organic matter, a "decomposer" whose only role is provide decomposition products to plankton or plants. Phototrophic bacteria, synthesizing types of microorganisms in nature, have chlorella and blue-green algae that create a wide variety of organic matter. There are many types of chlorella and blue-green algae, some beneficial for the environment, and some others that are not.

Those of the bad type will rapidly increase when nitrogen and phosphorus are increased, will drastically reduce dissolved oxygen in the water, and make it uninhabitable for other organisms. Using EM, phototrophic bacteria work to release nitrogen, also microorganisms that work in conjunction with phototrophic bacteria recover the phosphoric acid bacteria in cells, and decidedly lower the concentration of nitrogen and phosphorus in the water. Therefore applying EM results in large amounts of nitrogen and phosphorus being absorbed, and putrefaction type of algae that have quickly sprung up will rot, and will not cause sludge.

At the same time, what will increase are other synthesizing types of microorganisms, and the type of all-purpose chlorella, typified by Coccomyxa, which performs photosynthesis. Chlorella called cyanobacteria, and blue-green algae that is an intermediate type of phototrophic bacteria, will also increase. There are various types of this blue-green algae as well. There is also a kind of blue-green algae that cleans water and removes nitrogen and phosphorus. Put in EM and these (looking at it from the human side) convenient microorganisms and algae with a high environmental purification capacity increase rapidly. So it is not just EM at work but the increase all at once of these synthesizing type of microorganisms (producers) other than EM that enrich the base of the food chain, creating the basis for biodiversity.

## Microorganisms create a plus $\alpha$ and enrich the natural world

Synthesis type microorganisms make sugars and amino acids, in short doing in the water and soil what green plants do, and supporting the plants and plankton or sea creatures. This is happening in the clean bottom of the water in an overwhelmingly large way. Microorganisms create a plus  $\alpha$  and enrich the natural world. Carbon dioxide on earth is a kind of missing sink, and it is not known where roughly 50% of the carbon dioxide has gone. Even if we calculated the photosynthesis green plants performed, only about 30% would be accounted for. It is these synthesis microorganisms which seem to support the function that fixes the carbon dioxide that we cannot confirm.

If we contaminate the water and use chemical substances and thereby weaken microorganisms with a synthetic function, this plus  $\alpha$  does not work well at all. When this plus  $\alpha$  works well, plants will also grow well and fix carbon dioxide gas more than expected. Once it is fixed it become humus, or charcoal, reducing CO<sub>2</sub>. From the view point of food, if the population of Earth is 10 billion, we will need the appropriate amount of carbon. For this purpose, current agricultural land must produce a harvest double what it produces now. If we fully employ the power of EM this will be possible. Therefore, twice the amount of carbon dioxide gas can be recovered. Viewed from such a perspective, carbon dioxide is an important resource to save the food crisis the human race will face in the future. People around the world have the illusion that if we reduce carbon dioxide and solve the global warming problem this will solve our environment problems, but this is confusing the problem. What is actually inherently frightening is the pollution of water and chemical pollution where microorganisms have been unable to work. It is this environmental pollution, including the atmosphere, that is at the heart of environmental issues. If EM is used as widely as water in the world the CO<sub>2</sub> problem will soon be solved.



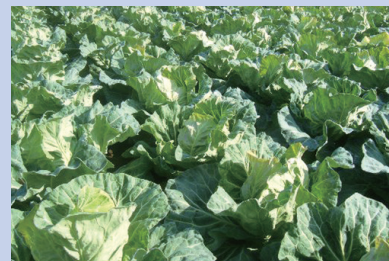
# EM Application Cases in the Tokyo Bay Area

## Toda City, Saitama Prefecture

In Toda City, Saitama Prefecture, is the Arakawa River, categorized as a first-grade river, and at Sakura River and Ayame River, tributaries of the Arakawa River, a project using EM to recover biodiversity has been implemented. The implementing organization is NPO Toda EM People net (Ms. Sachiko Ikegami, President). With the cooperation of the Toda City Office and Toda Rotary Club, this NPO has been able to continue its activities for more than 10 years.

First of all, it started applying EM to the Sakura River in 2002, and since then, every year about 24 tons of activated EM was applied. Since 2005, every year, 15,000 EM Mudballs have been put in and 17 tons of Activated EM has been applied into Ayame River. As a result, the bad smell from the river disappeared, now sludge on the riverbed of sludge is significantly reduced and the sand is visible.

In addition, according to the biological research of Toda City, they can now confirm the presence of sweetfish, smelt, eel, Rhinogobius, medaka (Killifish), prawn, line prawns, and Sesarma which they could not see back in 2000, with a diverse ecosystem being steadily recovered. From the beginning of spring to early summer, schools of mullet fry are swimming upstream, and there are more herons and cormorants that target these fish, a kind of seasonal poetic scenery.



## Miura Peninsula, Kanagawa Prefecture

Miura Peninsula is trying to widely establish an environmentally friendly type of agriculture using EM. "Miura Peninsula EM Study Group" was established by full-time farmers in Miura city and Yokosuka city in 1992 and currently has 20 producing members. Under the motto of "Delicious, healthful vegetables start from healthy soil," they are committed to making good soil and this area has become a base for supplying safe and healthful vegetables to the Tokyo metropolitan area.

In addition, the NPO EM Net Kanagawa has run the Kanagawa EM organic farming practice institute from 2008, and over 100 students have learned Nature Farming using EM. Agriculture to bring out the power of microorganisms without relying on chemicals, to restore the soil ecosystem, is instrumental in the prevention of soil erosion and groundwater pollution. There are some other local governments that utilize EM for dealing with odors in rivers and the seashore.

## Tateyama City, Chiba Prefecture

Tateyama City, Chiba Prefecture is a thriving area with industries closely related to marine resources, such as fisheries and tourism, but the pollution of the river because of the miscellaneous domestic drainage had drastically changed the ecosystem of Tateyama Bay. Under these circumstances, in order to realize the dream of "Leaving behind the cleanest sea in Japan to the children," the Association to Protect and Nurture the Sea of Awa was established in 2001 and began applying EM to the Dondon River that flows through the Funakata area in the northern part of Tateyama city. In 2004, it was officially registered as a Nonprofit Corporation. Activity enlarged to the Uda River and the Shioiri River and currently 5 tons or more of activated EM is applied into these three rivers every week.

This activity helped reduce stench and sludge in the rivers, and revived the Bean clam, a "protected living creature" in the Red Data book of Chiba Prefecture, for the first time in 30 years. Macra chinensis and Scapharca Kagoshimensis were also revived and the run-up of salmon can also be seen. In 2013, the Association to Protect and Nurture the Sea of Awa was certified as a non for profit corporation under the very rigorous screening standards for authorized nonprofit organizations, and to take advantage of preferential treatment this status affords, they are planning to further expand the range of their activities.



## Edogawa-ku, Tokyo

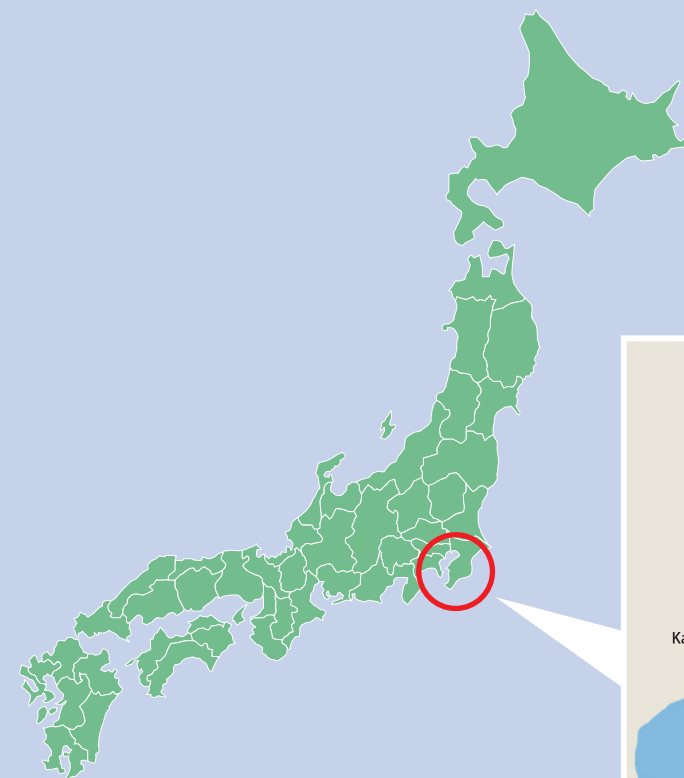
Edogawa-ku is the first municipality in Japan to introduce the concept of "Getting familiar with the water" and currently has 23 hydrophilic green roads and five water parks. These parks are managed by the Edogawa Environmental Foundation and 18 tons of activated EM a year was applied in nine facilities. All the facilities that have used EM confirmed a reduction of sludge and algae and the vigorous growth of aquatic plants. In particular, at the Nakai moat hydrophilic green road and Sakon River hydrophilic green road, there has been a proliferation of Pacific oysters, crabs, shrimps, goby and quasi endangered mudskippers, and during the season we see people who are out hunting for freshwater Shijimi clams. In addition, both with the Sakon River hydrophilic green road and the Arakawa River estuary downstream, Asari (Venerupis clams), Shijimi (Cyrenidae clams), Hamaguri (orient clams) are revived, and from 2013 people can enjoy splashing in the water at the Kasai Kaihin Park.

Mr. Hirofumi Imaizumi of the foundation says, "Because the rivers in Edogawa-ku are regaining a variety of ecosystems and diverse wildlife, as in the old days, we would like to protect the environment that many water fowls, shellfish and fish inhabit."



## Kawasaki City, Kanagawa Prefecture

Since 2012, local volunteers are working on a water system improvement of the Tama River water system Nikaryo Irrigation Channel. So far, 7,200 EM Mudballs and 6 tons of Activated EM have been applied in the channel.





# Utilizing EM Technology in Kumanonada, Mie Prefecture to reduce sludge and revive seaweed beds

## Overview:

Kihoku Town in Kitamuro County is surrounded by the sea, the mountains and rivers, and it is also a historic town which has Kumano Kodo pilgrimage routes that are registered as part of the UNESCO World Heritage. The proportion of the marine industry as a percentage of primary industry in the town is 67.3 %, highest in production value base. (From the 2004 municipal economic calculation.) A 2006 survey of residents finds that they view the town as being "Rich in nature and beautiful" (49.2 %), and as a "marine product industry town" (45.3%). In both name and reality the marine industry in Kihoku town occupies an important position. However, since its peak in 1975 this marine industry has decreased, and creating rich fishing grounds has become one of the most urgent issues. Therefore, in 2010 they began using EM technology, which has proven effective in the river environmental cleanup, sludge reduction and reviving seaweed beds in Lake Shiraishi and Hikimoto Bay. U-net (United Networks for Earth Environment, NPO) Mie plays a central role, and with the cooperation of Kihoku town EM volunteers, local divers shop MTK and Outside the Gulf Fishery Cooperative Kishu South Branch, they have been applying EM materials. In November of the same year, in cooperation with the seaweed beds revival project using iron steel slag that Sumitomo Metal Corporation constructed, they began a seaweed bed revival project in Jingu Island. In fixed-point observation, we found many kinds of living things such as conomurex luhuanus and Sargassum hemiphyl- lum of Family Sargassaceae hemiphyl- lum, etc.

## Purpose:

Sludge reduction and revival of seaweed beds in Shiraishi Lake, Hikimoto Bay and Jingu Island

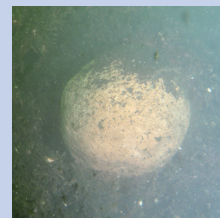
- Shiraishi Lake - sludge reduction
- Hikimoto Bay - sludge reduction, seaweed beds revival
- Jingu Island - seaweed beds revival
- MTK private beach - seaweed beds revival



EM cultivation machine



Activated EM



EM Mudball

## Materials Used:

### 1. Activated EM

(Total amount of usage was 48 tons up till now, the end of July, 2014.)

Added molasses as a food source for EM-1 and cultured with dominant in the microflora that are the basis of the ecosystem, and create an ecological balance.

### 2. EM Mudballs

(Total number of input 24,000, as of now, the end of July, 2014)

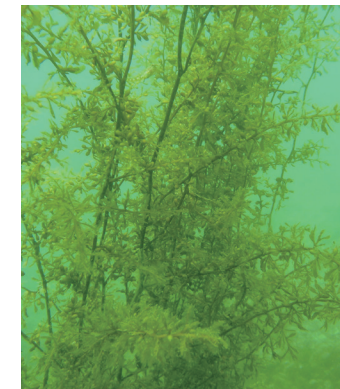
Mix the above activated EM, soil and Bokashi (fermented rice bran with EM) and let it ferment. The size of tennis balls. Have them settle on the bottom of the sea to mainly promote sludge decomposition.

## Effects of sludge reduction and seaweed beds revival using EM, and hopes for the future

**Mr. Yoshihiko Fujikura,**  
former manager of Diver Shop MTK



From the time of project started, I've been responsible for restoring the seaweed beds using EM, and seabed observation and recording sludge reduction. I first encountered EM two years ago. I have heard a lot about the effects of EM but it is true that initially I had doubts about its efficacy. I dive into a variety of seas because of my job.

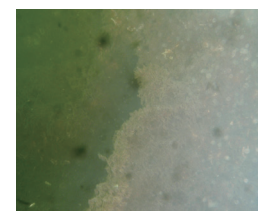
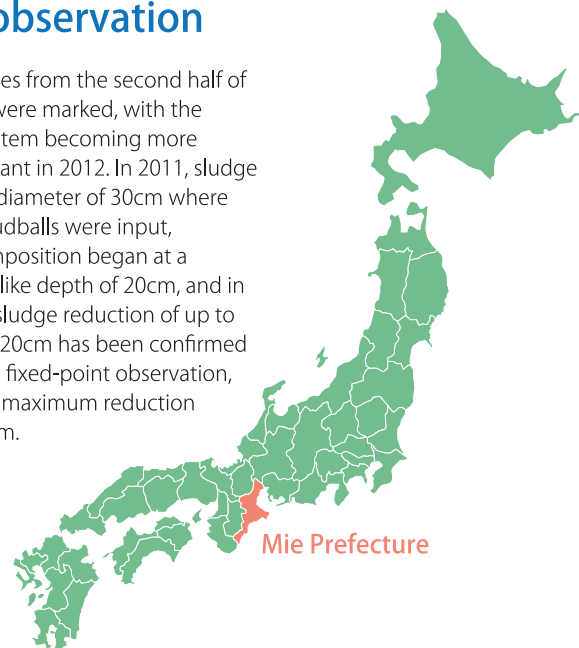


In recent years rocky-shore denudation has progressed, and I am one of people who actually witnessed firsthand the environmental degradation of the sea. I thought we need to stop the deteriorating environment, and that it would be great if it is possible to reduce sludge and increase seaweed beds, and I participated in this project with these expectations. In the course of the observation and recording actual changes using EM within two years, the sludge has been reduced by about 20cm to 30cm, and sea cucumbers and shellfish and the like have gathered around EM mudballs. At a private beach of MTK, Sargassum hemiphyl- lum of the Family Sargassaceae is growing, and objective observations show that the environment is improving.

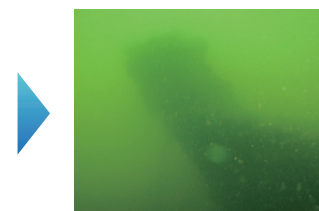
I am hopeful that by continuing this project, EM will make possible phenomenon that do not easily occur in nature now, namely sludge reduction and restoration of the seaweed bed. I hope that this project will be known throughout Japan and I would like to continue to cooperate in this activity, looking forward to a rich, clean, and revived ecosystem in the sea.

## Changes in the fixed-point observation

Changes from the second half of 2011 were marked, with the ecosystem becoming more abundant in 2012. In 2011, sludge had a diameter of 30cm where EM Mudballs were input, decomposition began at a crater-like depth of 20cm, and in 2012, sludge reduction of up to about 20cm has been confirmed overall fixed-point observation, with a maximum reduction of 30cm.



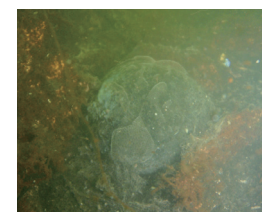
At the sea bottom, a fishing boat was buried in sludge, and only its tip was visible. (10/14/2010)



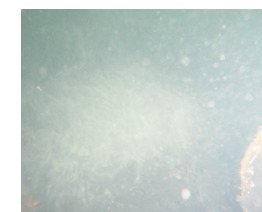
The sea bottom lowered 20-30cm, and the boat appeared more. (7/18/2012)



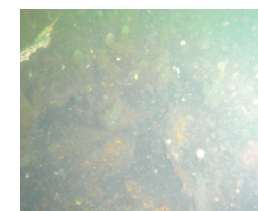
EM Mudball right after throwing. (11/15/2010)



Sea weed was observed around the mudball, indicating that microbes became active. (11/15/2010)



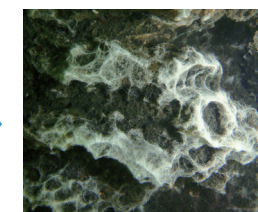
Sea weed was observed around the mudball, indicating that microbes became active. (11/15/2010)



Something like sea weed was found at the sea bottom. More biodiversity. (11/15/2010)



A goby was found at the spot. (6/25/2011)



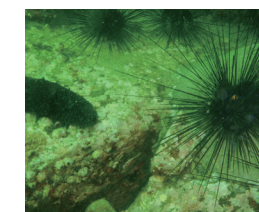
White bacterial thread spread out at where the sludge reduced. (10/23/2011)



Sludge reduced for 20-30cm



Sargassum hemiphyl- lum was observed. (2/24/2012)



Diadema and sea cucumbers started to be seen. (4/20/2012)



Strawberry conchs are observed around EM mudballs. (7/18/2012)

2010~

2011~

2012~



## Purification of Kawachi River, Kumamoto City and Ariake Sea

Kawachi Town, located at distance of about 30 minutes ride from the center of Kumamoto City, is surrounded by mountains and the Ariake Sea, and is well known as a tangerine and seaweed farming town. Kawachi River nearly divides Kawachi Town into north and south, and is a 6 km-long class B river. During the period of high economic growth the river became polluted, littered with discarded garbage, and no longer did we see any children playing in the river.

In this situation, in 1993 the Women's Association of this town started separating trash for recycling, and reducing garbage using EM Bokashi, declaring "We would like to preserve the beautiful Kawachi Town for the children of the future!" Since 1995, they have been active in treating household wastewater with Activated EM and in 1997, they launched the "Seseragi Group (seseragi means murmuring brook) and aimed to enhance their activity. The water quality of Kawachi River has improved every year since, increasing awareness of the people in town. Now sweetfish, clams and fireflies have returned, and the river has become an ideal place for children to encounter nature. Now fireflies appear regularly and in June every year a firefly festival is held and always draws great crowds.

In addition, the river is now clean, and the consciousness of fishermen has changed because of the abundance of clams and high quality seaweed. Fishermen are very grateful saying, "We are receiving most of the benefits from your activities." The women's division of the Fisheries Cooperative is also actively utilizing EM and working on purification of the Ariake Sea.



Kawachi River



Firefly



Kawachi elementary school children



Yoshino elementary school children



Member of Kawachi town firefly group at Kawachi river.



Member of Seseragi group



Fisheries Cooperative Association of Kawachi



We will continue to protect our town with the help of EM.



Black snails, feed for the firefly

## Environmental improvement of the World Cultural Heritage Todaiji Temple

Todaiji Temple, popularly called "The Great Buddha of Nara," is well known in Japan and throughout the world. Todaiji Temple has also been designated as a World Cultural Heritage site and they have applied EM to purify water in the Kagami pond, the creeks of the temple, and to enhance growth of trees and as the measure to deal with harmful deer droppings. We interviewed Miss Kazuko Goto of a volunteer organization, U-net Nara prefecture, NPO.

### Bring back the brilliance of Kagami pond

Environmental improvement of Todaiji Temple by EM began with cleaning the water in Kagami Pond located in front of the Hall of the Great Buddha. Like the name implies (kagami means mirror) the pond used to be a clean and beautiful like a mirror. However, in the fall of 2007, blue-green algae appeared, the water turned brown and the bad smell was a serious problem. Also, they said that many fish swam on the surface of the water in the pond because of a lack of oxygen, so herons could easily attack them. The General Affairs director of Todaiji Temple was searching for any solution for this problem and consulted the government. He was introduced by the river section chief of Nara City to Mr. Goto's EM volunteer activity group that had been successful utilizing EM in purification of the river that flows through the center of the city.

So immediately the general affairs director participated in an EM workshop. He decided to implement the use of EM at the end of the year and established an EM culture apparatus. In January 2008, they started to apply activated EM into the ponds and the creek that connects to the pond. In April, he made 2,000 EM Mudballs with children from Todaiji Gakuen kindergarten and threw them in the pond. As a result, within only three months from the start of applying EM E. coli in the Kagami Pond is zero. Also, this eliminated red tide from developing, algae outgrowth and bad odor. Since then, there have been regular applications of Activated EM, and the mudball event has continued once every six month.



Kagami pond before (2007 October) and after (2009 July) cleaning with EM.

### Visible effects are everywhere

Mr. Goto said, "Thanks to the clean clear water returning, water that used to be dirty and muddy, we can now see ripples on the surface of the pond. And when it comes to water clarity, where previously we could not see anything in the water, now we can see to a depth of 50cm to 1 meter. Ponds at the Todaiji Temple are connected to creeks and to increase the fireflies that live around the creeks we put EM treated bait in baskets to help grow the freshwater snail, *Semisulcospira libertina*, that is the food the larvae of fireflies. In June, we saw many fireflies flying. After that every year in June, the ponds have become the Todaiji Temple's hidden attraction."



EM cultivation plant



400L of Activated EM is poured into the lake regularly.



## Mikawa Bay and Ise Bay in Aichi Prefecture

Mikawa Bay Purification Citizen School, which was established in 2002 in the Mikawa Bay area, exhibited at the Aichi Expo Seto venue in 2005 regarding their activities. With the slogan, "Exciting environmental purification," and as a volunteer activity that makes use of the autonomy and independence of each individual, we continue to expand EM activities in various areas because we enjoy it. We use EM with the different methods and purposes in various areas, in drainage from each household, direct application into rivers, in hotels and other companies, in livestock industry septic tanks, and EM applied agricultural drainage in fields and rice paddies. The amount of EM input continues to grow every year and through the rivers, such as the Yahagi River, it is flowing into Mikawa Bay.

As a result, there has been significantly increased run-up of Ayu (sweetfish) to Yahagi River, the quality of fishery products has improved, including the short-necked clam, and the fish catches have increased, too. In addition, the small dolphin ("finless porpoise") that it was feared had sharply decreased in number are now frequently seen, and it has been observed that the number of individual dolphins has been increasing. In Chita Peninsula, twenty five organizations affiliated with the Bay One Citizen's School which was established in 2006, has carried out the application of EM in a variety of forms, such as in drainage channels and ponds, clams have greatly increased, especially in the south part of Chita Peninsula, and more and more people are enjoying shellfish gathering. In the Ise Bay, "EM Exciting Net Mie" was launched in 2007, in cooperation with the local fisheries and school children, and they are trying to improve water system. In 2009, three groups, the Nagoya Horikawa Lions, the Horikawa Eco Club and EM Aichi NPO, began applying activated EM into Horikawa River, which flows through the center of Nagoya city down to Ise Bay. Horikawa River was contaminated by the influx of industrial wastewater and household sewage, and had problems with odor and poor water quality, but now the bad odor is greatly reduced, and biodiversity is returning.



Finless porpoise came back to Mikawa Bay



Throwing mudballs at Taketomi town.



Hérons can be seen at Hori river.



Pouring EM from fishing boat at Ise Bay.



Pouring EM to the river at Yokkaichi City.

## Water system improvement efforts using EM across the country

### Applying EM nationwide on Marine Day

We, U-net, considers National Marine Day as "EM Day," calling for simultaneous application of EM throughout Japan every year. In 2013, on the fourth anniversary, 484 groups, a total of 17,416 people in 47 prefectures, participated in this activity and applied 508,204 EM Mudballs and 928,181 liters of activated EM.



In the wake of the laver (Nori seaweed) crop failure, since 2000 seaweed farmers have taken the lead in utilizing EM. The following year after they started to use EM, the yield of laver stabilized and good quality dried Nori seaweed is being shipped. With this result, since 2002 at Yanagawa city office, volunteers began to distribute activated EM free of charge.



Kurashiki City, Okayama Prefecture, Iwakuro Island, Kagawa Prefecture and Yuge Island, Ehime Prefecture in conjunction with school children in many places in the Seto Inland Sea are implementing water system improvement, and they have been successful in reviving seaweed beds and ecosystem diversification.



In Takashima City efforts were taken to apply EM to the street drains in residential areas as a measure to deal with miscellaneous household drain water. Semisulcospira and sweetfish have returned to some creeks.

Ariake Sea

Seto Inland Sea

Lake Biwa

**Great East Japan Earthquake disaster area**

Large quantities of EM were utilized throughout the areas affected by the Tsunami and for the disposal of fishery products. This helped hygiene environmental improvement over all.



**Kasumigaura**

In 1997, local volunteers began applying EM into Koise River, which flows into Lake Kasumigaura. Then EM volunteer groups in various places along the Kasumigaura water system were organized and they have been very actively applying EM into Sonobe River, Sanno River and Hokota River (Kitaura).



**Mikawa Bay**

Activities that apply EM to the water system that flows into Mikawa Bay have been developing in Chita Peninsula. In the rivers in which EM was applied, a large number of sweetfish have been seen swimming upstream, there have an increased number of clams in the estuary, and now groups of finless porpoises are also seen offshore.



**Ise Bay**

"Mikawa Bay, Ise Bay Purification Major Strategy," begun in 2000, became the forerunner of the movement to apply EM nationally on the annual Marine Day. Currently volunteers continue to carry out purification of water system by applying EM as part of elementary and junior high schools' environmental education, and work together with fisheries cooperatives.



**Yodo River & Dotonbori River**

Local volunteers and SPC JAPAN (Beauty Industry Association) are actively applying EM into the rivers and have had good results, with a reduction of bad odors and an increase in living creatures inhabiting the rivers.

