

Environmental Education Rooted in the Local Area of Kashiwajima Island, Otsuki, Kochi

Masaru Kanda*

Non-profit organization: Kuroshio Zikkan Center
(625 Kashiwajima, Otsuki, Hata, Kochi 788-0343)

Abstract

Kashiwajima in Otsuki is a treasure island located in the southwestern end of Kochi Prefecture with rich marine resources. NPO: Kuroshio Zikkan Center regards Kashiwajima herself as a Natural Museum and has been challenging the idea of "Sato Umi Zukuri" in conjunction with local citizens, volunteers, town or prefecture administrations, other NPOs, and various organizations. "Sato Umi" is an idea that people have to give something back to nature (the ocean) and cultivate it in some way beyond just getting its blessings, in order to be able to create a sustainable world. "Sato Umi Zukuri" aims to create a sustainable seaside inhabitable area according to the idea of "Sato Umi". The center's activities are divided into 3 large action categories: 1) Action to appreciate nature from the bottom of one's heart; 2) Action to improve people's livelihoods, making the best use of nature; and 3) Action to protect both nature and people's livings. These three categories are mutually related.

This paper shows how environmental education is connected with local government preservation and revitalization illustrated by several examples of the center's actions carried out in a local field.

Introduction

Kashiwajima Island is a small island 3.9km in circumference with an area of 0.57km² and is located in the Bay of Sukumo at the southwestern end of Kochi Prefecture and is part of the Ashizuri-Uwakai National Park. Administratively, the island belongs to the Town of Otsuki, Hata-county, Kochi Prefecture. The population reached 1,346 persons and 259 households in 1950 but decreased to 506 persons and 212 households in December 2007 as the island has suffered from depopulation and aging.

In Kashiwajima, fishery had long flourished, and the main fishing activities were red coral fishery, set-net fishery (Formerly, as many as 2,400 yellowfin tuna were caught at a time in the set-nets established in the Bay of Sukumo), fishing of yellowtail juvenile, yellowtail aquaculture, pole and line fishery of bonito, red sea bream and three-line grunts and purse seine fishing of horse mackerel, mackerel, sardine and blue sprats. But at present, due to exhausting resources, only one fisher is still engaged in red coral fishery, while set-net fishers decreased from three in the past to only one, because the aquaculture of yellowtail, red sea bream and tuna has increased and as a result, these species no longer visit the

bay area. There are now only a few pole and line fishers because not only have the catches declined but also the price of fish caught has been low, while purse seine fishers have disappeared. Fishing activities in the bay at present are mainly the aquaculture of red sea bream, striped jack, amberjack and bluefin tuna (Taiyo A & F), and pole and line fishery. Gill net fishery, etc. are carried out only on a small scale.

1. The sea around Kashiwajima Island

In the sea off the coast of Kashiwajima, the Kuroshio, the warm current from the south (oligotrophic current), and the eutrophic seawater running south from the Inland Sea via the Bungo Channel mix with each other, making it a treasury containing a wide variety of marine life. In the sea area in Otsuki, including Kashiwajima, a total of 123 species of coral have been observed. In addition, in the sea in Tosa-shimizu, a city adjoining Otsuki, 127 coral species were confirmed (Nomura *et al.*, 2005). Thus, although no coral reefs exist in the sea areas in Otsuki and Tosa-shimizu, a total of 170 coral species have appeared there; this is a larger number than the 151 species around Tanegashima Island where coral reefs exist and is smaller than the figure for the Amami Islands (220 species) only by 50.

*Corresponding author: e-mail kuroshio@divers.ne.jp

As for fish species, subtropical and temperate species coexist in the sea off Kashiwajima although it is situated in a temperate zone, and as many as 143 families and 884 species of fish have been reported in this sea area (Hirata *et al.*, 1996). The investigations of this sea have been continued, and at present, over 1,000 species, including unrecorded ones and those first recorded in Japan, have been confirmed (Fig. 1).



Fig. 1 An underwater scene showing coexistence of subtropical and temperate species of fish in Kashiwajima

In Japan, about 3,800 species of fish (including both seawater and fresh-water fish) have been observed in total, and one-fourth of them have been confirmed in the sea around Kashiwajima, only a small island about 3.9km in circumference (Nakabou, 2005). There is no other sea area in Japan where so many fish species have

been observed, which shows how rich in fish fauna Kashiwajima is because of its unique natural conditions.

2. The whole island as a museum

The Kuroshio Zikkan Center, a non-profit organization (NPO), regards the whole island of Kashiwajima, including both its resource-rich natural environment and the life of its inhabitants, as a museum. Based on the island, the Center carries out activities and provides information related to the sea, such as environmental conservation activities, environmental education and investigations and research. Through these activities, the Center helps enrich the life of people in Kashiwajima.

1) Creating sustainable “Sato Umi”

“We not only enjoy the products of the sea but also cultivate, develop and protect it.” --- This is the idea of “Sato Umi (the sea for the area and its inhabitants)” which we at the Kuroshio Zikkan Center have proposed. According to this idea, the Kuroshio Zikkan Center is working to create sustainable “Sato Umi” where people and the sea can coexist. To achieve this objective, the Center carries out the following three main activities (Fig. 2):

1. Activities for providing people the opportunities to actually experience and embrace nature;
2. Activities for encouraging people to make good use of nature in their daily life; and
3. Activities for protecting nature and people’s lives.

- Joint study of marine ecosystem with univ.
- Seminar and study meeting (Kashiwajima science)
- Field study, training and eco-tour
- Transmission of information

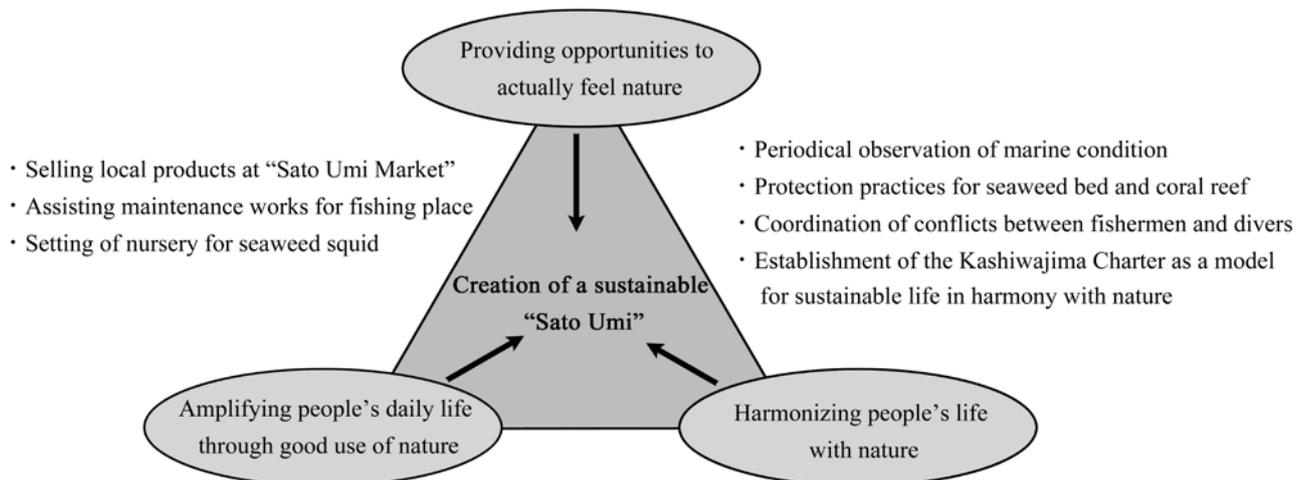


Fig. 2 Various activities covered by the Kuroshio Zikkan Center

These activities are mutually related to one another, and I will report here mainly our activities for environmental education.

2) The key word: “Zikkan” (to feel in your heart)

The first step in creating sustainable “Sato Umi” should be to fully understand the existing nature in the area. The Kuroshio Zikkan Center is attempting to discover the characteristics and values of the environment of Kashiwajima by conducting investigations of marine life and other resources in the district. The results of these investigations are quickly reported to the people of Kashiwajima at the “Sato Umi” seminar in a way which is easy for them to understand. We think these activities will help inhabitants have interest in, be proud of and become attached to their town. For children in the area, we conduct educational activities on the marine environment and provide programs of learning through practical experience so that they can really take to heart the wonderful features of their area. What we aim to attain is not merely physical experience which you have through your body but also mental experience which you gain with your mind or “Zikkan (to feel in your heart).”

Considering that a key word for the future will be “Zikkan”, we hold programs for learning through practical experience for children and eco-tours for adults in an attempt to give the participants opportunities for “Zikkan.” To make these activities as substantial as possible, we adopt the small-group system (Fig. 3).



Fig. 3. Training of snorkeling for children

3) Pleasure of discovering

It is relatively easy to hold programs for learning through experience for children from other areas. Let’s take the observation of life in the beach area as an example. Because all the living things these children find on the beach are those they have never known, they show a great interest in them. But children in the area always see these creatures and know them well. However, in

most cases, they actually know only a little about the creatures. They found sea urchins at the beach. When I asked them what they are, they instantly answered me: “They’re green sea urchins!” What they called green sea urchins were not green sea urchin but *Tripneustes gratilla*, but let’s ignore the problem of the name here.

Then I asked them: “How do these sea urchins move?” Their answer was “Oh, you don’t know that? That’s simple; they walk with their spines.” “O.K. Let’s observe that,” I put the sea urchins in a glass tank. True, we saw that they walked using their spines. Soon after, we found some of them began climbing the wall of the tank vertically. I asked the children: “Sea urchins walk with their spines; so don’t their spines stick into the glass wall?” They said that that would never happen. When I asked them “Why can the sea urchins climb the wall, then?”, they didn’t give me any answer. I said to them, “Let’s observe,” and the children carefully watched the movements of the sea urchins, sticking their faces to the tank; then they said: “Many long things like *enoki* mushrooms come out from between their spines and stick to the glass wall.” The children in the area had known only the fact that sea urchins have spines like those of chestnuts. (Children from a city would say that sea urchins are something yellow put on top of sushi wrapped with laver that you see in a sushi bar). Local children became aware that they had believed that they understood but they had not really understood sea urchins while they were asked questions and watched the creatures for themselves.

If you succeed in having children feel interest in something, they will find new things one after another by themselves. Is the hole on the back of sea urchins the mouth or the vent? What do they eat? Do they have a BM? They have a torrent of questions and try to find answers themselves. When they have several different species of sea urchins with different shapes, they will be interested in the relation between the shape and their habitat or the food they eat. Instead of explaining to children to give them the right answer from the beginning, we ask them questions so that they can cultivate the ability to find out for themselves.

Several days after the observation class for local children ended, I saw a participant in the program proudly teaching what they learned in the class to children from other areas.

4) Developing future leaders

It is a very important thing for us to teach the wonderful features of the sea to children who will lead the next generation. Wishing to educate as many chil-

dren as possible about the splendor of the sea, we are holding lecture meetings on the marine environment all over Japan, mainly in Kochi Prefecture, and are carrying out programs for learning through experience in Kashiwajima. We have received many reports of impressions from the children who took part in these activities. Many of them say that they have developed an interest in marine life or that they want to work to protect the marine environment in the future. We think it an important mission to have the next generation take over our work through these activities. But the generation closest to us is not that of elementary school children but that of university and college students.

We often receive from university students and young adults letters and e-mails saying “I was impressed with the activities of the Kuroshio Zikkan Center. Please employ me as a staffer for the Center.” It should be our task to develop these human resources, but we cannot do so easily. This is because the “job” of learning through experience and environmental education has not been recognized publicly as full-fledged work. Apart from education for entrance examinations provided at cramming schools, any activity whose name includes the word “education” or “learning” is generally considered to be “what should be provided at no cost” and gives the impression that it is offered by a public organization or on a volunteer basis. We are now working to have this type of activity recognized as a profession; when we provide high-quality programs for learning through experience, we strive to get a payment commensurate with the work.

But whatever high-quality programs we may offer to local children so as to teach them the splendor of their town, they won't take part in the program if its costs are raised. Considering that local people should lead in activities for protecting their environment, we are providing programs for local people on a volunteer basis in almost all cases. Thus, in an effort to tackle the dilemma mentioned above, we are working to increase the public awareness of our activities as professional tasks and at the same time to perform our work in cooperation with local people. Our objective is to become an NPO oriented toward local inhabitants' needs.

3. Environmental science of the sea of Tosa

In 2000, we started a joint study project with Kochi University. Commonly known as the Kashiwajima Project, this is the first joint study conducted with the cooperation of natural scientists (oceanographers) and social scientists (economists and jurists). The results of

the research in Kashiwajima obtained by both natural and social scientific approaches have been provided to students since 2001 in a common course at Kochi University entitled “environmental science of the sea of Tosa: considering the seaside of Kashiwajima (common name: Kashiwajima science).”

In 2005, the fourth year after the “Kashiwajima science” course was started, the lecture was changed from a program only within the university into a two-credit intensive course. The intensive course consists of two days' intensive lectures at the university and practice in Kashiwajima for three days and two nights. The practical course includes an experience in snorkeling, aiming at having students realize how wonderful the sea of Kashiwajima is, as well as a panel discussion where local inhabitants take part (Fig. 4).



Fig. 4 A panel discussion together with local people residing near Kashiwajima

In 2007, the Kuroshio Zikkan Center was entrusted with the project of promoting the UN Decade of Education for Sustainable Development (ESD) sponsored by the Ministry of the Environment. The “Kashiwajima science” course was included in the project and its content was enriched further; in cooperation with the Kochi Prefectural Board of Education, the course was offered to high-school students in Kochi Prefecture, too, as part of the joint project between high schools and the university. The course was also expanded from a two-credit one to four-credit one, and the hours of its classroom lectures were extended and scheduled before and after the practice in Kashiwajima. In addition to the traditional program for experiencing the wonderful features of the sea, a survey in Kashiwajima for investigating the charms and problems of land areas was added. After listening to the opinions of inhabitants at the panel discussion, the students held a workshop on these opinions and related subjects and summarized the values of Kashiwajima and

the problems of the area in their proposals.

4. Aiming at the coexistence of fishery with diving

In the sea off Kashiwajima, the catch of oval squid (or bigfin squid, seaweed squid) has been falling recently. This squid comes to the sea area in spring to spawn on horsetail tang and other large seaweeds, but in several recent years, seaweed beds have decreased as a result of isoyake (seaweed withering). Arguing that increasing diving activities are the cause of declining squid catch, fishers have begun trying to turn divers away from Kashiwajima. While it is impossible at present to prove the relation between diving and the catch of oval squid, the fishing results will not be improved even if divers are driven out. Thus we proposed that fishers and divers cooperate in installing the beds for the spawning and propagation of oval squid. More specifically, we adopted the method locally known as “shiba-zuke” in which the branches of *Quercus phylllyraeoides* available in and around Kashiwajima Island are placed in the sea. “Shiba-zuke” is the technique invented by the wisdom of local fishers; “shiba” (small branches of *Quercus phylllyraeoides* or bayberries) are bundled and put into the sea after stones are fastened to the bundles to provide seaweed squid with spawning beds.

In the joint work project, fishers and divers made spawning beds together using the “shiba” they had cut down in the nearby mountains. Instead of fixing stones to the shiba bundles as in the past, we devised a method of fastening iron bars to the bundles and fixing the bundles by driving the iron bars into the sea bottom. The completed spawning beds were transported to the spawning points by fishing boat and thrown into the sea; then divers fixed the iron bars into the sea bottom (Fig. 5).



Fig. 5 Throwing practice of a set of spawning bed by children for oval squids

In the traditional method of just throwing “shiba” with stones fastened to them, the “shiba” were often carried off by waves and currents, and the ovisac (each ovisac contains 7-8 eggs) was broken frequently when the “shiba” moved. These problems were solved by introducing the iron bar fastening method. While this method was more costly, there was an important meaning in divers and fishers working together. Another important problem was where the spawning beds should be installed. As researchers who have continued field studies in Kashiwajima for many years, we found the most effective locations and the spawning beds were established in these locations. It is generally considered successful if several tens to hundreds of ovisac are spawned per spawning bed, and our result was several to ten thousands of ovisac spawned, which was the best achievement in Japan. We filmed the process with an underwater video camera and the resultant movie has been shown at the “Sato Umi” seminar sponsored by the Kuroshio Zikkan Center for fishers, divers and local people. The movie has helped people realize the effects of iron-bar spawning beds because it appeals to them visually.

In the following year, we changed the method a little. This was because we feared that the *Quercus phylllyraeoides* in and around Kashiwajima might be cut down quickly by those who saw the great success of the spawning beds made from this tree. *Quercus phylllyraeoides* serves as forests for attracting fish, and if this tree is felled too much, not only the mountains but also the sea area will become barren. Thus in the following year, we decided to use the thinnings of Japanese cedar and cypress instead. The spawning on the spawning beds made from these conifers was only two to three thousands per bed; although even this figure was far higher than the national average, it was much less than the result in the previous year.

5. Recycling model of mountains, rivers and the sea with children

With the message “Forests are the lovers of the Sea,” Mr. Shigeatsu Hatakeyama in Miyagi Prefecture started nationwide activities for encouraging fishers and children to plant young broad-leaved trees in the mountains. We planned to extend his activities so as to give participants the chance to really feel learning experiences and developed a new environmental learning program for children in Kashiwajima and in the neighboring village of Mihara in the third year after we started the spawning bed project. As part of the learning of the relationship

between mountains, rivers and the sea, children from the coastal area of Kashiwajima and from the mountain village were given the chance to experience thinning work in an artificial forest.

Through this experience, they learned the meaning of thinning and the roles that mountains, especially forests, played. By developing rich forests, nutritive salts are provided to the sea via rivers, which makes the sea rich. But it is difficult to see the process directly; in other words, children cannot easily see the nutritive salts supplied by forests, the phytoplankton that propagates using these salts and the zooplankton which grows by eating phytoplankton. The zooplankton is then eaten by small fish, which they can then see with the naked eye; thus, they cannot actually realize the link between forests and the sea until the trophic level reaches its fourth stage. Children learn how important the thinning of forest is and take the thinnings they get to the seaside; if they make spawning beds using the thinnings and install them in the sea, they can help increase marine resources. At a glance, the spawning beds of seaweed squid look like “forests in the sea” (Fig. 6).



Fig. 6 School of oval squids gathering near the spawning beds

In the third year after we began this project, we improved the design of spawning beds made out of Japanese cedar and cypress considering the behavior of seaweed squid. As a result, we succeeded in causing seaweed squid to spawn several thousands to 15,000 ovisac on “shiba” of conifers. We offered the achieve-

ments, mainly photos taken in the sea, as teaching aids to the local schools.

This project contributed to closer relations between people from various businesses (people engaged in forestry, fishers and diving agents) by giving children a part to play. In addition, it led to the realization of relations between “mountains, rivers and the sea,” which was brought home by, for example, the awareness by the participants that the resource of seaweed squid could be increased by utilizing the waste thinnings, produced in the mountain.

In summer, we can now see many schools of baby oval squid in the sea around the quays of Kashiwajima Island. The activities of children are steadily bringing about changes in the area.

Conclusion

We at the Kuroshio Zikkan Center always bear in mind that instead of regarding environmental learning only as a passive process, we should utilize and extend the outcome of the learning for the benefit of the area. In environmental learning programs, you learn about and come to understand your area better. You utilize what you learn in the programs in your daily life and help protect your area so that you can continue using it in a sustainable way. We believe that a series of activities like these will ultimately contribute to the creation of sustainable “Sato Umi.”

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