

Adaptive Resource Management and the State of the Fisheries in Himeshima, Oita

Shamik Chakraborty

Introduction:

Himeshima is a small island located in the extreme western part of Seto Inland Sea, 6km off the coast of Kunisaki peninsula. The peninsula is located in the Oita Prefecture, located in Kyushu. With a total area of 7 sq.km, the island is situated near the western border of the Seto-Inland Sea National Park. Himeshima is known for its marine fisheries, obsidian quarries (which is regarded as a national treasure of Japan), and its tourism potential. According to the Oita Prefectural population statistics, the island has a total population of 2,047 persons living in 901 households (**Oita ken no toukei, 2013**).



Figure 1. Location of Himeshima (Image courtesy Google Earth)

Fisheries: Himeshima is known as a rich fishing area. The main types of the local catch include the following varieties:

Sea bream (鯛), octopus (タコ), flathead (コチ), Japanese tiger prawn (車エビ), barracuda (カマス), black rockfish (メバル), Japanese sea perch (スズキ), fat greenling (アイナメ), sea eel (ハモ), mackerel (サバ), cod/haddock (大口), thread-sail filefish (ハゲ・カワハギ), bleaker (タナゴ), horse mackerel (アジ), chicken grunt (イサキ), Himeshima right eye founder (姫島カレイ) largehead hairtail (タチウオ), puffer (フグ). Other important marine products include,

seagrass (わかめ)、amamo seagrass (アマモ)、sea cucumber (ナマコ)、and sea urchins (ウニ)、turban shell (サザエ)、sea cucumber (ナマコ)、abalone or ear shells (アワビ).

However, the fishing industry in the island is under pressure from pollution of near-shore regions, over-fishing and unsustainable land use practices which result in a decrease of the marine biological diversity near the island (Miyazawa, 2005; Yanagi, 2004). Originally there were 18 types of indigenous fishing practices performed in Himeshima, but only a handful remain today (Yanagi, 2004). Himeshima has also seen a sharp decrease in the number of fishermen--the number of active fishermen declined from around 300 in 1930s to 160 at present (interview data by the author).

Yanagi's (2004) article on the fisheries management in Himeshima states that the natural forests in the island were severely degraded during the beginning of the Meiji period. This had an adverse impact on the fisheries in the island. But a ban in forest cutting for 30 years, starting from Meiji 24th year saw a recovery of the forests of Himeshima and its fisheries. The fisheries were also protected by the *Kisetsu sadame* (期節定), an old law of natural resource management in the island.

What is adaptive resource management?

The concept of adaptive resource management was pioneered by **Holling (1978)** and **Walters (1986)**. This type of resource management has been given adequate attention by scholars only recently, but most specialists agree that some forms of this management were practiced by traditional societies throughout the world. Adaptive management seeks to continuously improve management practices of a resource or a resource pool by learning from the policy outcomes (**Taylor et al 1997**). It often involves common sense, experience, experimenting and monitoring (**Bormann, et al, 1999**).

A major part of the local economy in Himeshima revolves around fishing communities. Fishing communities in Himeshima have experienced bountiful times as well as degraded condition of their most important resource pool. The decline of fisheries in Himeshima, in spite of communal resource conservation systems is a puzzle for adaptive resource management--it can be claimed that the case of this island is useful for learning about resource management failures.

Examples of some adaptive resource management from Himeshima

The earliest practice of managing fisheries by managing surrounding landscapes probably began during the Meiji era. Around 1891 (Meiji 24th year) protection of shoreland fisheries through forest protection in the upland was stressed, and a considerable area under upland forests was protected for the fisheries. This type of forests are known as *gyoufurin* (漁付林) (Yanagi, 2004). Before the implementation of the *gyoufurin* concept, forests of Himeshima were mainly used for supplying fuel for the local community. Repeated felling of trees through the years for wood fuel resulted in a degradation of the forests. Planners observed a strong correlation between the healthy forests and healthy fisheries and introduced the idea of *gyoufurin*.

In addition to the concept of *gyoufurin*, the fishermen of Himeshima observed community based resource management which was mainly informal in nature. Around the beginning of the 20th century (Meiji 37th year) a special type of communal law for fishing in the waters around Himeshima was introduced as a written code--this is known as *Gyogyo kisetsu sadame* (漁業季節定め). *Gyogyo kisetsu sadame* was nothing but the collection of informal rules of fishing activities around Himeshima in written (published) form, and this combined edition called for careful management of the fisheries by restricting fishing. Restrictions would apply for types of the catch, types of fishing methods, and the timing (which day of the month in a year can be used for fishing). Miyazawa (2004) observes that *Gyogyo kisetsu sadame* was applied for adjustment between gill net fisheries and other more informal and conventional type fisheries such as angling, long line and seine fishing.

At present, Himeshima has 5 conservation zones--these were designated in 1977. These are: *nishiura* (西浦¹), *minamiura* (南浦), *matsubaraura* (松原浦), *taikaiura* (大海浦), and *inazumi* (稲積). In these areas, fishing is possible only using fishing rods. The laws are especially strict on catching of ear shells(アワビ), turban shells (サザエ), and sea cucumbers (ナマコ).

¹ In Japanese *ura* (浦) means inlet, cove or bay.



*Figure 2. Approximate locations of the five conservation zones of Himeshima
Image Courtesy Google Earth)*

From 1985 fishermen in Himeshima started to observe a rest day known as Kyugyo- bi (休魚日) when no fishing would take place, this was a communal decision for conserving the fisheries. Fishermen do not go to sea on this day and the time is used in planning for the next catches, discussing and learning from the everyday experiences in fishing activities.

These communal rules and management practices come from old times, and show the important aspect managing a resource as ‘commons’ --by continuously learning and applying knowledge for improved management, involving common sense and community experiences. These rules and practices represent a form of adaptive management. However, fisheries around the island have become noticeably poorer in recent years, thus it can be claimed that this type of adaptive management has failed to preserve the integrity of the ‘commons’ resource pool. Why did this happen? What are the limitations of adaptive management of a commons resource pool over large spatial scales and long timeframes? This paper attempts to cast some light on this paradox.

Data Collection: the researcher used in depth face to face interviews as a primary method of collecting field data. This process is elaborated below:

Interviews: The empirical part of this paper is based on face to face interviews with three fishermen who currently practice fishing as their main job. One of the respondents is a wakame sea grass collector and fisherman

(age: 55). He comes from the Taikai (大海) fishermen family in Himeshima. Trained by his father, this person has been fishing around Himeshima since his childhood (for about 40 years now). The second respondent is a diver and fisherman (age: 43). He has been diving in the waters around Himeshima since the age of 15. The final respondent is a fisherman (age: 65). He has been fishing around Himeshima for a long time, taking over the trade from his father's generation.

Major questions of the interview were about the fishermen's experiences and recent factors or changes responsible for the decline of the fisheries. The questions tried to identify factors *other than overfishing*. Overfishing and unlawful fishing have been regarded as major causes of the decline of the fisheries around Himeshima. How new types of fishing activities such as the use of faster boats and a variety of nets efficient to produce great catches cause a decline of the fish stock has been discussed by Tetsuo Yanagi in his article *Himeshima no gyogyou shigen kanri* (Yanagi, 2004).

Results of the interviews:

This paper stresses on the most recent changes in the environment around Himeshima. These are factors that go beyond simple and direct political ecological explanation. The information is gathered mainly from the experiences of the interviewees.

One major factor for the recent decline of fisheries is identified as the cessation of nutrients from the Kunisaki Peninsula--this flow of nutrition is vital for the sea grass beds that support the fish population. One interviewee recollected that about 10~20 years ago a lot of nutrients for sea grass beds came from the mixed deciduous forests of Kunisaki peninsula. Streams in Kunisaki are bigger and slower compared to Himeshima, and as a result they tend to inject more nutrients into the sea. The slowness of the flow ensured that fallen leaves had time to decompose, giving nutrient rich runoffs to the Suo Nada Sea when the forests were rich in diversity. The degradation of sea grass beds means the loss of food source, resting and hiding places for fishes. The effects of changes in nutrient runoffs on the fisheries around Himeshima have seldom been addressed in the policy literature. This shows that a part of the existing problems lies beyond the spatial boundary of Himeshima. The much larger size of the Kunisaki peninsula compared to the island, its unique near-circular shape and evenly spaced centripetal drainage (natural outlets) ensure an efficient distribution

of nutrients in the waters of the Suo Nada Sea and around Himeshima. It is worthwhile to mention here that the native vegetation of Kunisaki peninsula was broadleaved evergreen trees. This native vegetation cover was replaced with the human managed *Kunugi* and *Konara* vegetation. These two types are deciduous, and they shed their leaves in the winter. Thus, Kunisaki represents a Satoyama landscape,² which has a strong correlation with the diversity of the marine ecosystems around Himeshima (Satoumi).

From the interviews it was apparent that there is a sudden increase of mud in the sea bottom around Himeshima. This mud is found at a depth of about 10 meters below sea level and is about 6 inches to a foot in depth. Before coming to a rest at the sea bottom, the mud is in suspended form in the water, making the water murky. This makes it difficult for sunlight to penetrate to the bottom of the sea. This is a major factor that inhibits the growth of sea grasses and the fish that thrive in these environments. Two creatures that have experienced the worst outcome of such sea bed degradation around Himeshima are the Amamo sea grass and a type of local sea urchins known as *asa-uni*. Amamo sea grass (*Zostera marina*) has become extinct from the waters around Himeshima.



Figure 3. *Murky waters seen in the Shoreland waters around Himeshima. Note the deep bluish tinge of the water away from the shorelands. The arrows represent areas of clear waters. (Photograph by the author)*

In fact, this type of murky water has also been observed by the friends of the interviewees who work as fishermen in Yamaguchi Prefecture and in Shikoku. This widespread phenomenon probably indicates a degradation of

² Human managed landscapes with a mosaic of land uses mainly combining agriculture and forestry, they have direct influence on the shoreland fisheries.

the land condition near the streams--most possibly due to alteration of vegetation patterns or other anthropogenic changes to the land cover. This kind of sediment runoff and the resulting physical pollution of the sea bottom degrade the base of the ecosystem in shallow seas like the Seto Inland Sea.

Concluding remarks from preliminary findings

Adaptive resource management of fisheries around Himeshima was partially successful in conserving the fisheries of the area: they worked when the main factors behind stable nutrient supply to the ecosystem worked in their favor. But the condition changed in recent years, the fisheries are affected by a range of different factors that originate in distant locations. The most recent degradation of the fishing stock seems to be strongly correlated with the cessation of nutrient flows from the Kunisaki peninsula, and the increased murkiness of the shallow waters. The latter phenomenon is also partially related to the land cover changes in Himeshima³. These two factors are identified as the most recent, and major reasons for the decline of fisheries around Himeshima (in addition to overfishing) in spite of adaptive management of local resources. The clear change in the nature of the nutrient inflows into the Suo-Nada Sea from Kunisaki Peninsula, the impact on the seagrass beds which have showed a decline over the last 30 years and the disappearance of the amamo sea grass also coincide with the period that saw a rapid decline of the fish population around Himeshima. This shows that adaptive management can fail in cases where notable external factors are involved, and ecosystem flows must be considered for a better management mechanism.

Further studies:

The impact of nutrient flows from the Kunisaki peninsula on the marine ecosystem around Himeshima is largely unexplored till date. Research on this issue must be augmented with further studies on the present situation of seagrass beds and the conditions of the seabed of the Seto Inland Sea. There is also a need to explore the relationship of such changes to the

³ For more information on the history of land changes see Yanagi, T. 2004. *Himeshima no Gyogyou Shigen Kanri* (in Japanese). Engineering Sciences Reports, 26(2), Pp. 215-217.

alterations in the surrounding land cover. The Himeshima case shows that the two creatures that suffered the worst fate are inhabitants of the seabed (Amamo sea grass and *Uni* sea-urchins). Thus a fuller understanding of how the fisheries are related to the sea bed environment, and how that environment in turn is related to the surrounding land areas is required to address the recent ecological changes around the Himeshima Island.

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