Producing Plaster: Traditional Uses and Knowledge of Coral on Ishigaki Island, Okinawa

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Abstract

A lagoon reclamation project on Ishigaki Island for the purpose of building a new airport caused much controversy at the end of the 1970s because it would destroy the well-developed coral reefs around the island. Since then, the view that corals were biologically and ecologically valuable and to be conserved has pervaded the island. During this period, however, it has been almost forgotten that corals used to be used as building materials, in particular, lime plaster—a highly processed product derived from corals. From fieldwork, particularly interviews with retired plasterers, I reconstruct the process of traditional plaster production. I also discuss why and how plastering flourished and declined between the 1940s and the 1960s and describe how social attributes of the plasterers on the island differed from those on Okinawa Island—the main island of the Ryūkyū Arc—from which the art of plastering was imported. To consider conservation and recovery of coral at the local level today, it is important to respect such a history of coral uses and to recognize the possibility of various concerns about coral.

Keywords

Plaster • Plasterer • Traditional uses and knowledge

5.1 Introduction

Ishigaki Island (石垣島, Ishigaki-jima) is the second-largest island in the Yaeyama Islands of the southern Ryūkyū Arc. It is located more than 400 km from Okinawa Island—the main island of the Ryūkyū Arc—but less than 300 km from Taiwan. The island is administratively within the city of Ishigaki in Okinawa Prefecture and is the center of business and transport in the Yaeyama Islands. The population of the city is about 47,000 at present.

The islands in the Ryūkyū Arc are within a subtropical climate zone and have unique terrestrial and aquatic environments. Well-developed coral reefs can be observed, especially around the Yaeyama Islands, Miyako Islands, Okinawa Island, and Amami Islands. They have attracted a number of domestic and international tourists. However, these coral reefs have been degraded over decades as a result of anthropogenic effects, such as land development, especially after World War II. Moreover in the 1970s and 1980s, they were severely damaged by crown-of-thorns starfish. Then, in 1998, coral bleaching also occurred widely, due to the increase in seawater temperatures.

Since these two events, conservation and recovery of corals have been recognized as an urgent issue, and many scientists and nature conservationists have visited the islands to survey the present state of the corals and discuss countermeasures. Indeed, it seems that something of a "coral boom" has occurred and that a certain view of the corals, that corals are biologically and ecologically valuable and to be conserved, has come to be emphasized on the islands and more widely.

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Against that, at the end of the 1970s, Okinawa Prefecture made a plan for the reclamation of a lagoon in Shiraho, located in the southeast of Ishigaki Island, to build a new airport. This project caused much controversy among scientists and nature conservationists from outside the area, as well as among local inhabitants. Shiraho is famous for its rich corals, particularly for large colonies of blue corals, and corals became the most powerful motivation for opposing the reclamation. The view that corals were biologically and ecologically valuable and to be conserved pervaded the discussion. The cultural value of corals was also invoked to support this view, and it was emphasized that Shiraho's lagoon had traditionally been a local fishing ground, on a daily basis (e.g., Noike 1990; Kobashigawa and Mezaki 1989).

The long-standing discussion did bear fruit; eventually, in 1989, the reclamation plan was abandoned. In fact, the new airport issue seemed to have accelerated the "coral boom" on Ishigaki Island.

I started my fieldwork in 2009 with an interest in the position of corals and coral reefs in present-day local communities. In my fieldwork, I soon noticed that a "positive" view of corals was not necessarily shared deeply among the local inhabitants, particularly among those who had experienced the era before the "coral boom." Indeed, some of them told me that they hardly ever went to the beaches or the sea and knew almost nothing about the corals. One man in his 80s pointed out that it was only recently that people started to say anything about the corals. Another inhabitant, in his 70s, who had been engaged in fishing, commented that there used to be nobody who valued the corals as good or pretty objects, but that the situation had changed since the new airport issue had emerged. Thus, I came to doubt that the "positive" view of corals and coral reefs was local or traditional.

In fact, according to a classic ethnography, written by a local ethnographer Fumi Miyagi, fishing on the island had long been "primitive" and "very inactive," and functioned only on a minor subsistence basis. She did mention, however, the direct use of corals as building materials and for kitchen wares (Miyagi 1982 (1972)). Furthermore, a reliable dictionary of the Yaeyama dialect, written by Tousou Miyara, a local linguist, included words related to coral. Table 5.1 provide a list of them and show the possibility that corals were, at least in 1930, recognized basically as "stones" among the original inhabitants using the local dialect (Table 5.1) (Miyara 1930).

Thus, there would seem to be a gap between the present view and the old, local view regarding the corals. Bearing this in mind, in this chapter, I provide a short review of lime

Table 5.1 Yaeyama dialect words related to corals from "Yaeyama vocabulary" (Miyara 1930)

Words	Specific plane	Phonetic symbols	Part of speech	Literal meaning
イナガ・イシ	Shiraho	inaga-is'i	n.	Sea stone
イン・マチィ	Ishigaki, Shiraho	im-matsï	n.	Sea pine
ウール	Ishigaki	u:ru	n.	Sea stone
ウル・イシ	Ishigaki, Shiraho	uru-is'i	n.	Sea stone
カサ・イシ	Ishigaki	kasa-is'i	n.	Shade stone
カツォーラ・イシ	Shiraho	katso:ra-is'i	n.	Shade stone
チィブリィ・イシ	Ishigaki	tsïburï-is'i	n.	Chrysanthemum stone
ボージィ・イシ	Ishigaki	bo:dzï-is'i	n.	Shaven head stone
ムン・ッシィ・イシ	Ishigaki	mun-ssï-is'i	n.	Wheat thrashing stone
ウール・ヌ・パイ	Ishigaki	u:ru-nu-pai	n.	Sea stone ash
ウールヌパイ・イシ	Ishigaki	u:ru-nu-pai-is'i	n.	Stone for sea stone ash

*Here, "Ishigaki" means former Ishigaki-cho, the western half of the Ishigaki Island. Miyara wrote that the standard Yaeyama language was spoken in Ishigaki-cho (Miyara 1930: 3)

plaster—a highly processed product derived from corals—and plastering, from fieldwork I conducted intermittently from 2009 to 2012 on Ishigaki Island.

5.2 History of Plaster in Okinawa

If you walk on the island, especially around the areas that have been populated for generations, such as the urban district known as Shika, you can easily find corals used as building materials at private houses (Fig. 5.1). Typically, there are foundation stones of brain corals, with their round shape, curbstones of hump corals that are easy to cut, and spread gravel of branch corals. Hump corals are also used as wall blocks. Sacred and religious places, called "on" in the Yaeyama dialect—"utaki" in the standard Okinawan dialect—are often full of coral materials, and, sometimes, corals themselves are treated as objects of worship (Fig. 5.1). Apart from building materials, corals have also been used for kitchen wares, such as grinders, because of their jagged surfaces, as Miyagi noted, and also as weights for looms or boats, just like stones.

Today, it is almost impossible for the local inhabitants to extract corals from the lagoons, as I discuss below, but in the past, inhabitants used to gather living corals when they needed to process them because "raw" ones were softer. They also gathered dead corals, mainly on the beaches, or reused old materials if they required little processing.

Lime plaster, or simply plaster, on which I focus here, is the most processed coral product in Okinawa. It is well

Fig. 5.1 Corals used as building materials at a private house and at a sacred and religious place on Ishigaki Island, August 2009 (Photo by author)

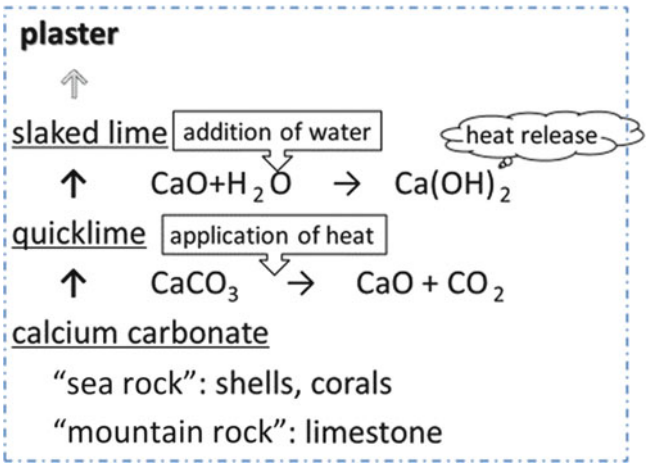

Fig. 5.2 Main ingredients of plaster

known that plaster as a building material has been used in various places all around the world since ancient times, mainly for making flat and smooth surfaces for walls and floors. Lime plaster is one type; the paste, basically composed of slaked lime and water, hardens as it dries.

The raw materials for slaked lime in Japan can be classified roughly into "mountain rocks", that is, limestone, and "sea rocks", including shells and corals. While "mountain rocks" are much more common, the primary component of both is the same, calcium carbonate. During processing, firing (calcination) converts "rocks" into quicklime (calcium oxide, CaO), and subsequent addition of water converts the quicklime into slaked lime or hydrated lime (calcium hydroxide, $Ca(OH)_2$), with the release of heat (Fig. 5.2).

Corals had been used as a raw material for plaster not only in Okinawa but also in several areas in the Shikoku and Kyūsyū regions of southeastern Japan. Usually chopped rice straw was also added to the paste in Okinawa, instead of seaweed and hemp, as in many other regions in Japan. The final product is called "muchi" in Okinawa, including Ishigaki Island, which originally meant pounded rice cake, because the plaster has a similar texture. Powdery quicklime is also called, at least in Shika of Ishigaki Island, "ūru-nu-pai," which literally means ash of coral or "sea rocks" (Table 5.1) (Miyara 1930).

Plaster was used primarily for roofing in Okinawa, not for smoothing walls or floors. Traditional roofs are often covered with unglazed tiles, called "kawara," and plaster is applied to the joints to reinforce the whole roof, in particular to resist heavy rainstorms in the typhoon season. It was important to apply plaster thoroughly. Plaster was also used to shape tombs and to join boat planks and wall blocks. It is also well known that quicklime, before being made into slaked lime, was an indispensable additive in producing brown cane sugar.

There are few remaining historical documents on plaster works in Okinawa. According to the description of "Kyūyō," a Chinese man who drifted ashore was the one who propagated the manufacturing method for firing shells in kilns in 1731 (Kyūyō Kenkyūkai 1974: 298; Kuniyoshi 2004: 41). However, it is also known that plaster was applied to the stone walls of Shuri Castle, the palace of the Ryūkyū Kingdom, built in the fifteenth century AD. Thus, the use of kilns presumably started earlier than that (Kuniyoshi 2004: 41). After they started manufacturing plaster, the kingdom came to control that work under the magistrate's office of roof tiles. During this time, roofing with tiles was only allowed at Shuri Castle, temples, houses of certain "shizoku" (social class of rulers), and village offices, while thatch roofs were much more common. Thus, the use of roof tiles was centered on the cities of Shuri and adjacent Naha. It is assumed that the demand for plaster was high only in these cities; that is, construction with roof tiles and plaster used to be an urban phenomenon.

In 1879, the Meiji Japanese government abolished the Ryūkyū Kingdom when the islands were incorporated as Okinawa Prefecture. Any restriction on the use of roof tiles was practically lifted then, and demand for plaster among the people generally increased (Ishii 2010: 182).

During World War II, many buildings were destroyed, especially in the Battle of Okinawa. After the war, constructing buildings and roofing with tiles were encouraged in the process of recovery, led by the government of the Ryūkyū Islands—that is, self-government by native Okinawans during the American occupation of Okinawa. The "construction rush" had started and again the production of plaster became a viable business. However, shortly thereafter new materials, such as industrial cement, were introduced, and new building styles—without tiles—were also invented. Thus, the demand for plaster decreased rapidly. In 1972, when Okinawa reverted from the USA to Japan, "coral fishing," that is, fracturing reefs, and collecting sand and rocks were all banned under the Sea Area Fisheries Adjustment Regulations (Okinawa Prefecture website).

On Ishigaki Island, it is recorded that roof tile craftsmen were brought from Okinawa Island and they started manufacturing tiles in a kiln in 1695 (Editorial Section of the General Affair Department, Ishigaki City 1999: 41). There is hardly any documentation regarding plaster then, but it seems reasonable to assume that there was already some demand, although construction with roof tiles and plaster was probably more unusual among the local common people, compared with Okinawa Island with a more urban culture. After the lifting of the restrictions on the use of roof tiles, demand for plaster increased, as in other parts of Okinawa. However, until the beginning of the twentieth century, the plasterers on Ishigaki Island were from Okinawa

Island and stayed there only while they worked. Then, gradually, some of them came to reside on Ishigaki Island and brought their families (Editorial Committee on History of Ishigaki City 1995: 830). Interestingly, on the island, even after World War II, traditional construction styles and techniques were not replaced as quickly as on Okinawa Island (Higa 2006: 78). Thus, the "construction rush," using roof tiles and plaster, lasted until about 1960, and it seems that quite a few local-born plasterers emerged during this time. However, in the 1960s, some destructive typhoons hit Ishigaki Island, prompting the diffusion of new materials and new building styles. It was 1967 when the last tile factory closed, and the number of plasterers also declined rapidly (Editorial Committee on History of Ishigaki City 1995: 830). In 1989, Mr. MN, a plasterer whom I describe later, opened a new tile factory, partly to revive the traditional construction culture, but closed it down after only a few years.

5.3 Stories from Plasterers on Ishigaki Island

Presently, on Ishigaki Island no craftsman is producing plaster from raw materials. Many of the more elderly people remember that there were quite a few kilns for plaster, but they are all now gone, without a trace. At least two plasterers—Mr. TU and Mr. MN, who are retired—and one widow of a plasterer, Mr. AB's then wife, survive. I interviewed all three regarding a traditional plasterer's work.

It is rather difficult to clarify the types of work plasterers have undertaken in the Okinawan context. There are at least four independent skills related to plastering: (1) acquiring corals as raw materials, (2) burning corals to produce quicklime, (3) processing quicklime into plaster, and (4) applying plaster to roofing with tiles. Strictly, those engaged, at least, in (4) are "plasterers," but particularly on the remote islands, such as Ishigaki Island, craftsmen tended to have to cover multiple skills. In fact, Mr. TU performed (2), (3), and (4), and Mr. MN and Mr. AB practiced all four skills. Moreover, Mr. MN had even produced roof tiles, as I mentioned. I interviewed them specifically regarding the process from (1) to (3).

Table 5.2 indicates the basic social attributes of the three plasterers. All started as plasterers before World War II (Table 5.2). As mentioned, on this island, the "construction rush" continued from the 1940s until around 1960, and, during this era, two different types of plasterers were active: "plasterers for generations," like Mr. TU, and "new entry plasterers," like Mr. MN and Mr. AB, who had started in their generation. In detail, Mr. TU's grandfather and father were plasterers in Shuri, Okinawa Island, and first came to the island to take jobs by themselves. After they decided to settle down on Ishigaki Island, they then brought their families over from Shuri. Plastering was their family business, and Mr. TU started his career when he was young, as an assistant to his father. In contrast, Mr. MN and Mr. AB learned their skills from other plasterers working on Ishigaki Island. Interestingly, Mr. AB used to be engaged in trading plaster produced on Okinawa Island, perhaps using connections to his father's homeland, Shuri, before becoming a plasterer himself. Mr. MN had experience in a number of jobs when he was young and then started working at a roof tile factory to master various skills, including plastering, on Ishigaki Island. He had also worked on Okinawa Island as a plasterer before coming back to his homeland to be independent. It is interesting that Mr. TU referred to the "new entry plasterers" as "jacks of all trades" and made a remark that there had been no professional plasterer originally on the island; he was clearly proud of his family and genealogy as the "legitimate" plasterers who could trace their ancestry back to having lived in Shuri on Okinawa Island and worked for the Ryūkyū Kingdom.

Here, I will describe the process for producing plaster. The three plasterers primarily acquired fresh corals as raw materials (Fig. 5.3). There were basically two ways of gathering coral: self-gathering and purchases from local fishermen. Mr. AB and his wife, living in Shiraho, used to go to the nearby lagoon at low tide. They walked on the dry or shallow parts to reach the reef crest and gathered corals particularly on the fore reef side. His wife said they snapped the roots of corals with iron sticks and put them in straw baskets. When a basket was filled, they carried it to the lagoon and asked a fisherman to carry it to the beach using his boat. She said that many kinds of corals were processable but "flat ones" were better than "pointed ones" because of density. On the other hand, Mr. TU and Mr. MN basically purchased corals from certain local fishermen who gathered living corals in addition to fishing. Many of the full-time fishermen were originally from other islands, such as Miyako Islands or Itoman, located at the southern part of Okinawa Island. However, both Mr. TU and Mr. MN sometimes also picked up dead dry corals on the beach or reused those from old houses.

The plaster kilns were built by the plasterers themselves using clay, tiles, and blocks (Fig. 5.4). It seemed common to build them on the beaches, but Mr. MN's was located further inland. They were also on the outskirts of the town because of the smoke and smell from burning corals. The method used to produce plaster from corals was common among the three plasterers, although there were also some subtle differences. Once they acquired corals, they dried them if they were raw or wet. Then, they piled corals in their kilns carefully, so as not to block the numerous vents, and burned them with firewood or waste oil and tires later. Corals need to be burned for approximately "3 days and 2 nights" or

Table 5.2 Social attributes of the three plasterers

Name	AB	TU	MN
Year of birth	1911	1928	1933
Place of birth	Shiraho, Ishigaki Island	Shika, Ishigaki Island	Shika, Ishigaki Island
Parents	From Syuri, Okinawa Island	From Syuri, Okinawa Island	Father from Shimane, Honshu. Mother from Ishigaki Island.
Background	Trader of plaster in Shiraho → Plasterer in Shiraho	Plasterer in Shika since young	Various jobs → Plasterer in Shika → Plasterer in Naha → Plasterer in Shika
Type of plasterer	"new entry plasterer"	"plasterer for generations"	"new entry plasterer"

Fig. 5.3 Carts full of corals in Shika, Ishigaki Island, in 1961. © Makio Andō (Reprinted, with permission, from Yaeyama Album: Track of 20th Century, Vol. 2 Ishigaki City 2001: 179)

about 50 hours, so at least two people were involved in continuously providing fuel.

After they stopped fueling the kilns and the fires were extinguished, the kilns were allowed to cool naturally for a day, and then the burned corals were taken out. By that time, the corals should have converted into white quicklime without losing their original shapes. The corals were then pulverized and covered with chopped rice straw; water was added and mixed. At this time, care was necessary because of the heat released from the mixture as a result of the chemical reactions. Then, they pounded the mixture in a mortar with a pestle and with machines later. This used to be thought of as a woman's job. Mr. MN said approximately 500 bags of 20 kg plaster were produced at one time, but the

Fig. 5.4 Lime kilns owned by Mr. TU in Shika, Ishigaki Island, in 1965. © Hiroo Ōnaka (Reprinted, with permission, from Yaeyama Album: Track of 20th Century, Vol. 2 Ishigaki City 2001: 179)

volume depended on the size of the kilns and the amounts of corals.

When they applied plaster on roofing with tiles, they carried plaster to the site and mixed it with water and sand. Apart from using it themselves, they also sold quicklime or plaster to others. At the time, quicklime was also used in producing brown cane sugar.

5.4 Concluding Remarks

From this short report on plaster and plasterers on Ishigaki Island, I would like to emphasize three points.

First, I reconstructed the process of traditional plaster production, which has not been recorded fully, at a time when the number of traditional plasterers is decreasing. It is now clear that, at least on the islands of Okinawa, corals from the sea were once gathered quite intensively as raw materials for plaster and were irreplaceable natural resources in the local construction culture.

Second, I found that the supply and demand for plaster on Ishigaki Island had long been limited because of legal restrictions and the distance from Okinawa Island during the era of the Ryūkyū Kingdom. The restrictions were lifted when the kingdom was abolished, and the situation then started to change. Particularly, after World War II, plasterers flourished in response to the "construction rush," but in the 1960s, they declined because of the introduction of new materials and building styles. Both events happened within short periods. The enactment of the Sea Area Fisheries Adjustment Regulations in 1972 truly put an end to the use of corals. In addition, the social perspective on corals has shifted from being regarded as natural resources to being understood as objects of conservation since the 1970s, and, thus, the construction culture of corals has been almost forgotten among the present local inhabitants.

Finally, I discovered the unique and non-monolithic nature of plasterers as a group on the island. The island had been located on the periphery since the era of the Ryūkyū Kingdom. As a result, there are various inhabitants who have emigrated, or whose ancestors have emigrated, from other islands for different reasons in addition to the original inhabitants. The "plasterers for generations" from Shuri or Naha were the ones who introduced and gave root to this traditional skill on the island; then, the "new entry plasterers," with various backgrounds, joined them when demand for plaster was high during the "construction rush." This shift can be understood as a process of localization on the part of the plasterers.

It is unfortunate that today corals are not to be touched and used, but only to be seen and cared for, within the context of nature conservation. I doubt whether this recent trend will lead to the successful conservation and recovery of the local corals, because it lacks a local perspective, based on traditional practices. We need to respect the history of coral use, recognize the possibility of various concerns about corals, and examine layered cultural values in the context of local inhabitants' lives. I believe that local-centered sustainable projects are only possible by doing this.

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