Precious Coral Protection and Development Association

MARINE ENVIRONMENT AND SUSTAINABLE USE OF PRECIOUS CORALS

PRECIOUS CORAL SUSTAINABILITY

Report on the Transplantation Project of Precious Corals in Japan

SUMMARY

In response to growing evidence of the effects of climate change and to address the increasing demand for better management of the harvesting and conservation of precious corals around the world, this report takes a look at efforts being made in respect of precious coral sustainability, with specific reference to the two-stage transplantation project initiated in Japan in 2016 by the Precious Coral Protection and Development Association, in cooperation with the Kuroshio Biological Research Foundation and Kochi University.

BACKGROUND

Precious corals have been used around the world as ornaments and accessories from ancient times onwards. Believed to originate from the Mediterranean Sea and dated more than 20,000 years ago, precious corals were exported worldwide for use in fine jewelry. Within Japanese culture, for example, the use of precious corals has continued to develop since the Nara period (AD710-794) using imported precious corals and is well established as a special product of Kochi Prefecture, where, located on the Japanese island of Shikoku, its waters are home to some of the highest quality precious corals in the world.

In today's world of high-end jewelry and decoration, coral continues to be a sought-after product of the jewelry industry. Indeed, it is the red, pink, salmon-colored and white varieties of corals belonging to the Corallidae family with their porcelain-like luster after polishing that tend to be the most popular.

THE STOCK ENHANCEMENT PROJECT (Transplantation)

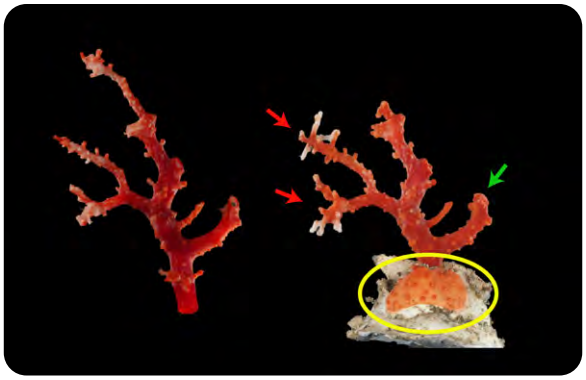
The transplantation project is taking place in a protected zone around Birou Island, Otsuki town in the Kochi Prefecture in Japan. In order to collect information to support future reforesting of local sea beds, the Precious Coral Protection and Development Association has initiated a two-stage transplantation project involving the transplantation of 813 small *Corallium japonicum* branches and, on a smaller scale, 46 samples of *Pleurocorallium konojoi*.

THE FIRST STAGE

Corals glued to reef-growing blocks

The first stage was the experimental phase of the transplantation. The fragments of the coral to be transplanted were glued to artificial substrates on 60-kilogram reef-growing blocks and subsequently released at the surface of the water in non-fishing areas. Results of the first stage showed that the transplanted precious corals had a remarkably high survival rates (99.1%: n=114). The coenenchyma and branches also grew well. It is to be noted that the periodical monitoring of the survival and growth of the transplanted precious corals is ongoing and will be continued.

Taking out corals from reef-growing blocks retrieved from sea



Left: Fragments before release

Right: Retrieved corals 936 days after release

Red arrow: Branches grown after release

Green arrow: Coenenchyma grown after release

Yellow circle: Coenenchyma expanded on glue

THE SECOND STAGE

Based on the successful results of the first stage, new types of small and easily transplantable substrates are in the process of being developed to make the transplantation more efficient on a large scale.

Coral needs a hard basement in order to strengthen itself. For this purpose, a disk-type matrix, in which the coral fragment is planted, is currently being tested as a new tool for transplantation. It is vital that the disk does not overturn during the process of being positioned underwater, at approximate depths of 100 m.

Three-type disks made of mortar (Fig.1) were tested in a harbor as deep as 14 m.

Fig.1: Trial three-type disks for precious coral transplantation

Disk 7, 4, 8 at upper-right end in the figure are lens-type (both-side convex), and Disk 7 at right end is lens type with central hole. Disk 1 to 6 at lower left side are half-convex disks. White color = top plane / yellow color = basal plane.

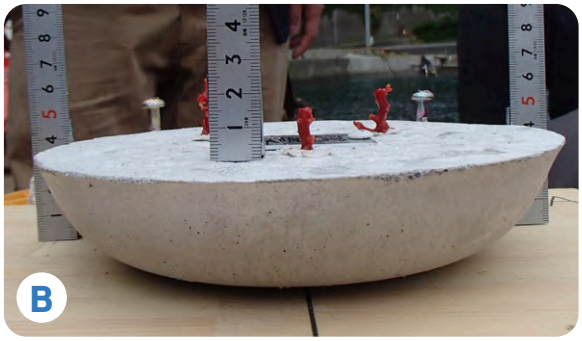
The success rates of lens-type (both-side convexity), lens-type with a central hole and dish-type (half-side convexity) were 40%, 90% and 100% (Fig.2A), respectively. The dish-type of 1.5 kg in weight and 4 cm in thickness with a flat top and bottom surfaces (Φ 18 and 10 cm) settled upside in a trial release of the coral planted disk off Kochi Prefecture (Fig.2B).

Fig.2: Results of settling tests for transplantation disk of half-convex type

A: Three disks sink down to nearly same point on sea floor as deep as 14 m without overturning, **B:** A successfully-settled disk on a sea floor as deep as 100 m without overturning.

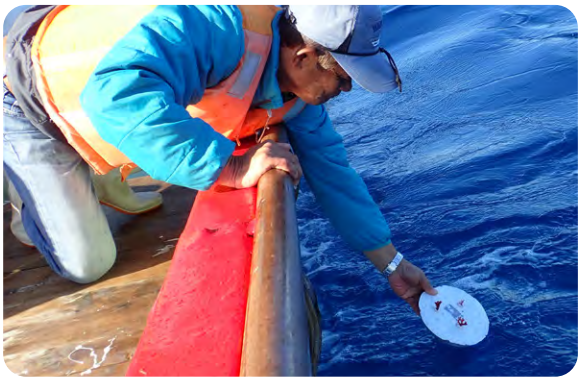
As a practical test, three fragments of living precious corals were planted on the upper surface of a disk (Fig.3).

Fig.3 Transplantation disk with planted fragments of *Paracorallium japonicum*



A: Overview of coral fragment planted disk,
B: Lateral view of the same disk.
This type of disk has a flat bottom for stability on sea floor. A three-hole disk implies that one of three planted fragments can survive and grow up for, at least, several decades.

Fig.4 Prepared transplantation disks with planted coral fragments



Each disk has three fragments planted and is stored temporarily in watered tubs. Then, they are transported to a former fishing field where coral fishing is currently prohibited, and are released there.

After being stored in tubs filled with sea water for a few hours (Fig.4-A), they were then transported to a former coral fishing field and released. This new method was tested in two test fields off Kochi Prefecture, where harvesting will only take place in several decades' time. Three-hole transplantation disks were made. It is expected that one of three planted fragments will survive and continue to grow for several decades at least.

CONCLUSION

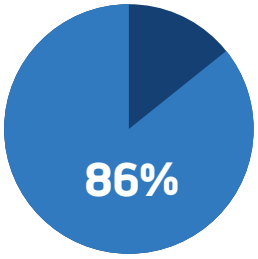
The first stage of the transplantation project recorded significant success, with the transplanted precious corals having high survival rates. The second stage is currently under way with the aim of developing new types of small and easily transplantable substrates in order to optimize success rates and enable more extensive transplantation programs, thereby contributing significantly to coral repopulation. This new tool will enable coral fishers to release living fragments of coral colony in their fishing field (Fig.4-B).

FAR OLDER AGE OF FOSSILIZED PRECIOUS CORALS COLLECTED IN KOCHI, SOUTHWEST JAPAN.

Tomoyo Okumura (Kochi University)

The precious coral sector is facing many challenges, leading to a growing demand for an improvement in resource management and sustainability initiatives. A call has been made to distinguish dead precious corals from living ones, enabling their management as a fossil resource, with the introduction of guidelines for dead coral harvesting.

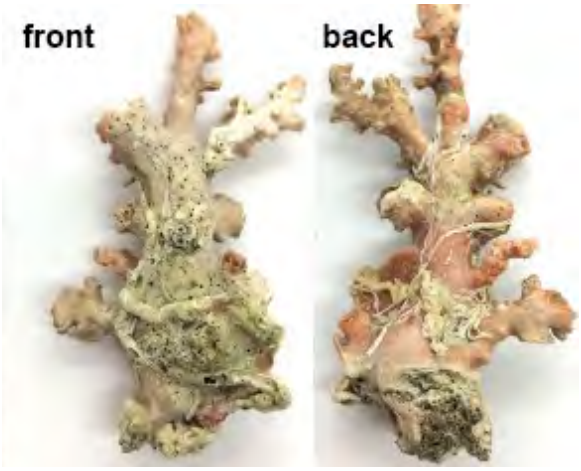
It is, in fact, possible to consider precious corals as a fossil resource as the dead (fossilized) colonies are also harvested and traded. In Japan alone, the dead colonies have accounted for as much as 86% of the whole trading amounts in the past 30 years.



Average percentage of the dead precious coral colonies in the whole trading amounts from 1989 to 2016.

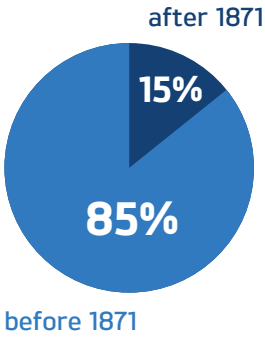
While the dead colonies of precious corals have been harvested and traded, their age, depositional processes, and preservation assessments have not, until now, been studied.

In order to start to gain greater understanding of their accumulation processes, a study involving radiocarbon dating for the dead precious coral colony fragments was undertaken. As part of this study, 54 dead precious coral specimens were collected, from a depth of around 100 to 200 metres, from the Ashizuri fishing field, off the southwest coast of Kochi Prefecture, Japan, which is one of the largest and highest yielding fishing fields in Japan.



The oldest precious coral specimen showing 14C age cal BC 5617-5488.

The results of the study showed that the oldest cal 14C age within the measured specimens was cal BC 5600*. Furthermore, 85% of the specimens measured in this study predated both the beginning of coral fishing activities in 1871 and the peak of fishing activities in the 1900s. Indeed, the results suggest that most of the precious coral colonies died due to natural causes, such as natural mortality, predation, and/or various forms of environmental degradation, rather than due to destructive fishing activities.



Results of 14C dating show that 85% of the measured specimens were dead before 1871.

A greater understanding of the accumulation processes provides insight into the requirements of improved resource management.

It is important to consider that the stock of dead corals may be somewhat larger than the stock of living ones, which could lead to a longer timespan of precious coral fishery.

Whilst dead precious corals have not previously been a focus in either scientific research or resource management, it now appears vital to focus on dead precious corals otherwise they could begin to disappear without appropriate resource management.

For sustainable fisheries collecting precious corals, it is important we make the distinction between dead precious corals and living ones and manage them as a fossil resource. To this end, the introduction of new guidelines for dead coral harvesting is required.

*The result is published by Okumura et al. (2020) in Radiocarbon (doi; https://doi.org/10.1017/RDC.2020.114.)

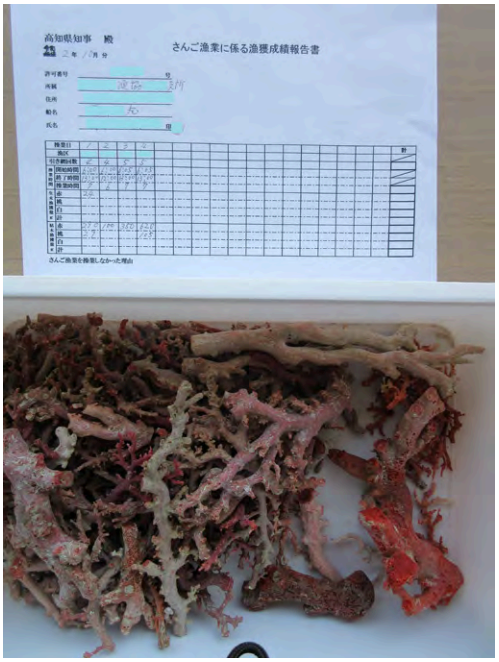
VOLUNTARY UNDERTAKINGS TO ENSURE TRANSPARENCY FOR SUSTAINABLE UTILIZATION.

Traceability in the trade of precious corals is a key element in the elimination of illegally harvested materials. By enabling the supply chain to be more transparent, with tracking of goods by species and by geographic provenance, greater visibility and tighter controls will be achieved. With this aim in mind, relevant stakeholders are currently working closely together in Japan to establish traceability by increasing transparency of the harvest and distribution of precious corals.

The voluntary undertakings to ensure transparency for the sustainable use of precious corals include the following steps:

MEASUREMENT AND IMAGING OF CATCHES

Each fisher sorts the collected precious corals by type, and the fisheries cooperative association, in the presence of a neutral third party, measures the weight and takes a picture of the corals. Images of the sorted precious corals must be taken with the weight marked on the scale together with the catch report to be submitted to the prefectural government.



CERTIFICATE OF CATCH SOLD

The Japan Coral Association organizes bidding events. At the log bidding, all relevant information is provided to the organizer to include the "Certificate of Catch Sold" confirming that the catch is

not the product of Illegal, Unreported and Unregulated (IUU) fisheries, as well as the trade date and transaction volume provided by the fishery cooperative association or its branch office responsible for the sale of the catch.

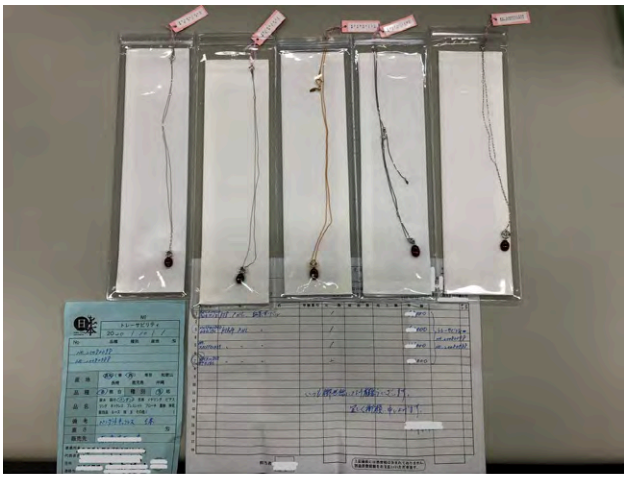
TRACEABILITY SLIP

- At the log bidding

An identification number is allocated to each log exhibited with the «Certificate of Catch Sold». The Japan Coral Association issues a «traceability slip (for bidding)» that describes information such as the identification number, variety, type, weight, and production area, which is subsequently attached to the relevant successful bidder log. Buyers, who are members of the Japan Coral Association, purchase the precious coral through the log bidding process.

- For the processors and wholesalers

Relevant handlers, who are all members of the Japan Coral Association, distribute the purchased precious coral to processors, wholesalers, etc. The handlers ensure that a "traceability slip (for business establishments)" is attached to the product prior to the sale of the coral to the next vendor.



- At the retail shops

The retailer who purchases the product with the «traceability slip (for business establishment)» ensures that the information written on the slip is clearly displayed in the retail store. Furthermore, the retailer makes the consumer aware of the information with respect to the traceability slip prior to purchase.

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