Study on Marine Forestation Using Charcoal Plates

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Introduction

Fallen trees and drifted woods collected in reservoirs are incinerated to dispose of, hence a source of CO2 emissions. However, by carbonizing these materials, CO2 emissions can be reduced by 50% or less. Charcoal has a porous surface that gives it absorptivity and this feature can be utilized to effectively promote the growth of seaweed conceptacles. To verify the practicalness of this technique, a growing plate was made of charcoal and tested along the Wakayama coast, and fundamental data was collected towards an eventual practical application.

Overview of Results

Experiments were done to determine the effectiveness of charcoal as a material for promoting the insertion of Kajime and Sargasso conceptacles. Insertion was evaluated in a tank using soft charcoal, hard charcoal (binchoutan), natural stone, mortar concrete, porous cement and porous ceramic filters. Charcoal was found to be a better material for the insertion of juvenile plants.

Next, in order to identify the effectiveness and durability of charcoal in open water, charcoal (soft charcoal) and, for comparison, small blocks affixed with porous concrete were sunk in an area where Kajime and Sargasso grow wildly. Observations of conceptacle insertion showed, as in the earlier experiment, the charcoal to be a superior growing base for seaweed. However, in further monitoring, durability problems arose as some of the charcoal had broken off or detached under strong waves, such as during typhoons.

Here, to ensure durability and reduce manufacturing costs in mass-production, a plate with undulating surface was fabricated using a mix of charcoal and cement. From strength tests on various prototypes, the ratio of charcoal to cement was set at 1:1. Also, the porosity of the charcoal that was lost by mixing was restored by carefully selecting striking time and washing the surface before the slab completely solidified. This charcoal plate was affixed to a large concrete block, sunk in the sea and tested for seaweed growth promotion. It was found that juvenile insertion in the plate was good.

Conclusions

The seaweed growth tests conducted this time installed the developed charcoal plate on new underwater structures. As the next step, tests are underway to establish simple techniques of growing seaweed through installation on existing underwater structures and rocks, as a countermeasure to erosion and means for recovering lost seaweed resources.