Developing a method to grasp coral reefs through remote sensing technology

**by**

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**Abstract**

Due to the effects of land reclamation for harbors, etc. and development activities such as sea route dredging, as well as the global influence of an increase in the seawater temperature, etc., coastal coral reef sea areas around the world are exposed to risks such as bleaching and coral disappearance, which may be accompanied by a damaging effect on the diverse living things inhabiting the coral reef, the fisheries industry, sightseeing and the disaster prevention functions of the coral reef. For Madreporaria alone, which is the main reef-building coral, there are 839 species on the IUCN red list. For that reason, in the case that development activities are conducted in coral reef sea areas, it is important to evaluate the impact, and to consider avoidance, minimization and corrective measures with regard to the impact. Here, using two types of remote sensing technology, a means of accurately understanding the coral distribution in coral reef sea areas will be introduced. The first is (1) a technology for understanding coral distribution using high resolution multispectral satellite imagery, and the other is (2) a technology for performing a 3D analysis of coral reef and understanding coral distribution using underwater video footage. (1) is able to accurately understand and analyze wide-area coral distribution and coverage in coral reef sea areas at a scale of tens of km2. (2) is able to specifically understand and analyze the terrain of coral reef in an area extending approximately ten meters in every direction, and the distribution of individual corals and seaweed. As an example, we will report the results taken from Okinotorishima in Japan. Okinotorishima is a shallow island measuring approximately 4.5km east-to-west, 1.7km north-to-south and with a depth of less than 10m. For the understanding of coral distribution from the satellite imagery in (1), it was possible to analyze the coral distribution and coverage with 80% classification accuracy as a result of obtaining satellite imagery of the entire island and applying coral coverage guidance data based on image clustering and field surveys. By obtaining satellite imagery for several years and conducting the same analysis, we were able to understand the change in the coverage area over the years. For the underwater video footage analysis in (2), video footage was taken of knolls in the coral reef in an area extending ten or more meters in every direction, and we were able to make a three-dimensional understanding of the coral distribution using a 3D analysis. Also, as a result of classifying the coral in a part of this area, classification accuracy of 80% or more was obtained. These technologies can be considered as useful tools to quantitatively understand the influence of development activities such as sea route dredging and the effects of prevention measures such as coral transplanting.