The influence of the construction of the seawall on the on the coastal plant community in Sendai coast

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[Introduction]

As a result of the tsunami disaster caused by the Great East Japan earthquake in March 2011, in the coastal area of Sendai, the living environment that constitutes the ecological system and its survival base has been destroyed and disturbed on a large scale. Since then, the spontaneous recovery of ecosystems has been confirmed, however, due to human modifications by the disaster recovery project such as the reconstruction of the seawall, afforestation for protection forest and the construction of elevated road as embankment, the ecosystem has been irreversibly modified again. However, the impact of these man-made changes on the coastal ecosystem has not been made clear.

The purpose of this study is to identify the impact of seawall construction on the coastal eco-tone. Therefore, the disturbance of coastal vegetation by tsunami disaster and their recovery rate were monitored at Miyagi after the restoration project in Miyagi prefecture. Most importantly, make clear the impact of the seawall on coastal ecosystem, especially on the division of coastal vegetation.

[Methods]

Considering the width of the beach, greening mode of the seawall and the change of the back area, the survey was carried out in three areas of Miyagi prefecture: the Arahama area, Ido area and Yuriage area. Three survey lines were set up from coastal forest to shoreline in each area, which are orthogonal to the seawall. 1 m ×1 m quadrats for vegetation survey were set up at every 5 m along the survey lines.

The plant species / coverage (%) / grass height (cm) were recorded. In addition, samples of sand were collected at every 10m along the survey lines, and the particle diameter composition (mm), electrical conductivity (mS / m) (EC) / potential of hydrogen (pH) /nitrate-nitrogen and phosphate-phosphorus content of each sample were measured. At the same time, digital surface model (DSM) were created by SfM using aerial photos taken by UAV. The surveys were conducted from 2018 to 2020, once a year, from late August to early September.

In order to clarify the relationship between the change of topography and soil environment and vegetation. In every area, Pearson 's correlation coefficient and Spearman’ s rank correlation coefficient were calculated in order to clarify the correlation between the number of species, Coverage (%), pH, EC and the particle diameter composition.

[Results & Discussion]

According to the vegetation survey results implemented in 2018 and 2019, the vegetation structure of the seaward and landward was also different according to the width of the beach from the shoreline to the seawall. The wider beach on seaward of the seawall was, the higher the number of species and vegetation

coverage of the coastal dune plants were. And the wider beach also increased the number of species and vegetation coverage of the exotic plants and the inland plants. On the other hand, the number of species and vegetation coverage of coastal dune plants are higher in the area with less human disturbance. Those all suggest that the coastal ecosystems have resilience from natural disturbance but vulnerable to human disturbance.

Keywords: green infrastructure, coastal plant community, coastal dune plants, human modifications

