

Survey on the Impact of Sea wall on the Vegetation of Coastal sand dune

*XIANGMEI ZHONG¹, Hajime Matsushima², Akira Suzuki³, Yoshihiko Hirabuki⁴, Kouji Kimura⁵

1. Graduate school of Agriculture, Hokkaido University, 2. Research Faculty of Agriculture, Hokkaido University, 3. Kita-no-satohama Hana-no-kanehashi Network, 4. Faculty of Liberal Arts, Tohoku Gakuin University, 5. Snow Brand Seed Co., Ltd.

[Introduction]

In recent years, many extreme events have come out due to climate change such as heavy rain, typhoon, etc. Large amounts of expenses are required for disaster-management measures. However, with the declining of population, the government budget is gradually lessening. On the other hand, people's interests about disasters risk reduction are increasing. Before the disaster in 2011, at Yuriage district in Miyagi prefecture, coastal sand dune, pine forest and backward wetlands can be seen from the shoreline to the landward. In 2011, it is clear that the tsunami disturbed the organisms that support the coastal ecosystem and the environment which is the foundation of its habitat on a large scale. Since the coastal sand dune ecosystem here was disturbed, it has been restored naturally over time and then as a tsunami protection measure, a large seawall was built. Later, on the land side of the Sea wall was reclaimed by the mountain soil. However, the impact of them on the coastal dune ecosystem is unclear. This study clarifies the ecological impact on coastal sand dune vegetation of the Sea wall and mountain soil. And if there is a negative effect, how can we reduce that effect? This study records it as a reference for future solutions.

Three sites at the Yuriage district were selected as survey targets (figure 1.). From the north to the south: the Yuriage area 1 (Y1), the Yuriage area 2 (Y2), and the Yuriage area 3 (Y3). In Y1, the Sea wall was built about 2 years ago and the coastal ecology recovered in nature. In August 2017, plants (*Ixeris repens*) were planted on both sides of the Sea wall in Y2. In Y3, the Sea wall was built about 5 years ago, and the coastal ecology recovered naturally. Additionally, the land sides of the three survey areas were reclaimed with mountain soil.

[Methods]

A belt was set up from the coastal forest to the shoreline. Then, the terrain was recorded with Unmanned aerial vehicle (UAV). Vegetation surveys were conducted at 5m intervals and Plant species / Coverage (%) / Grass height (cm) were investigated. Furthermore, samples of sand were collected at intervals of 10m, and the particle diameter composition (mm) as well as Electrical Conductivity (mS / m) (EC) of each sample were measured. After that, the average plant volume (mm³) was calculated. Based on the above data, the current status of the plants on both sides of the Sea wall and the physical environment were analyzed.

[Results&Discussion]

About the result of vegetation, there are three plant species on both sides of the Sea wall: *Imperata cylindrica*, *Digitaria ciliaris* and *Artemisia capillaris*. On the land side, *Artemisia capillaris*, and *Setaria viridis* are the dominant species. On the sea side, *Carex kobomugi*, *Glehnia littoralis*, *Calystegia soldanella* and *Ixeris repens* are the dominant species. It is obvious that the plant species on land side and sea side are different because of the separation by the sea wall. It can be seen that the distribution of plants on the

land side is significantly affected by the mountain soils, resulting in an increase in the number of inland plants, such as *Setaria viridis* and *Trifolium repens*. From the EC value, it is evident that the trend from the shoreline to the sea wall is gradually decreasing, and the trend from the sea wall to the inland is increasing. The phenomenon that the EC value increases inland can be considered as the impact of artificial coverage of mountain soil. About the result of particle diameter composition, it is obvious that the medium sand has a decreasing trend from the shoreline to the inland side. Closer to the shoreline, the proportion of the very fine sand is increasing. The closer to the inland, the greater the proportion of the very coarse sand and the coarse sand.

In general, the composition of particle diameter on both sides of the sea and land of the sea wall is of difference, and this phenomenon may be caused by the barrier effect of the sea wall. This phenomenon may become larger as time goes by.

Keywords: coastal plants, ecotone, green infrastructure, the sea wall

