Distribution Characteristics of Marine Litter and Coastal Plants on the Coast Section

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1. Introduction

Natural coasts have been rapidly reduced because of erosion, direct destruction, human disturbance and pollution in recent years. In particular, marine litter that is discharged directly or indirectly on the coast every year is also an important factor that cannot be ignored. In addition, with the increasing frequency of human activities on the coast, coastal plants have also been extensively and severely affected. Without coastal plants, beach sand would be more easily carried away, and maintaining the current dune terrain would be impossible, it can also be said that the current dunes were created by coastal plants. Marine litter and coastal plants are distributed on the coast together, necessitating an understanding of the distributional characteristic of marine litter and coastal plants.

The Genkai-nada coast in Itoshima Peninsula is an important coastal area in western of Fukuoka Prefecture, within the administrative jurisdictions of Itoshima City and Fukuoka City. The present research investigated the quantity and types of marine litter and the coverage and types of coastal plants of Nagahama Coast, Fukuoka City and Niginohama Coast, Itoshima city over an entire year to understand the distribution characteristics of marine litter and coastal plants, and then discuss the influence from the coast section, Finally, effective suggestions are made to deal with marine litter and protect coastal plants, in order to optimize the coastal environment.

2. Survey and results

2.1 Survey method

The two survey sites in this study are the Nagahama Coast and the Niginohama Coast on the Itoshima Peninsula. The Nagahama coast is about 3 kilometers long and faces the semi-open Hakata bay, which is greatly affected by tidal currents. The Niginohama Coast is about 6 kilometers long and faces the open Karatsu Bay, where the dynamic changes of the coastal environment are more intense. Surveys were carried out four times on Nagahama Coast and three times on Niginohama Coast from March to November 2020. Through pre-investigation, I opted 5 monitoring areas on each coast **(Fig. 1)**, and divided each monitoring area from the back of the beach to shoreline into a number of 1×1m observation squares and recorded the quantity and types of marine litter and coastal plant coverage and quantity of types in each square **(Fig. 2)**. In addition, the coastal section data was obtained by RTK- GNSS.

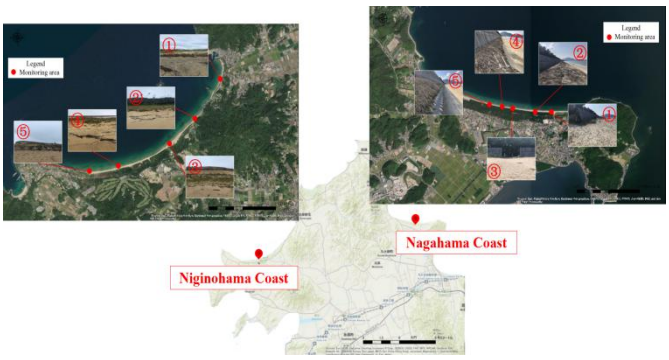

Fig. 1 Monitoring areas in survey sites

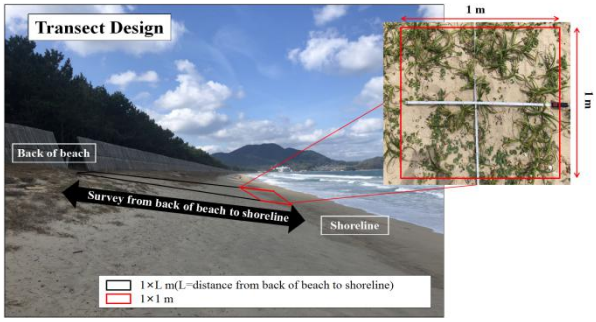

Fig. 2 Transect design

2.2 Survey data and discussion

The monitoring data shows that the species quantity of marine litter in winter on the Nagahama coast is less than in spring, summer and autumn. As the entrance to the Niginohama coast, the species quantity of marine litter in monitoring area 1 and 5 are obviously more than in other areas. The distribution of styrofoam debris (<0.5 cm) is the most in all the monitoring areas on the two coasts. Moreover, there are few coastal plants in monitoring area 3 on the Nagahama coast (only *Carex kobomugi* survives). Since the artificial revetment in monitoring area 5 on the Nagahama coast, the habitat of coastal plants is limited to a narrow area between the artificial revetment and the fence. Except for the autumn and winter data in

Key words: marine litter, coastal plants, distribution characteristic, coast section
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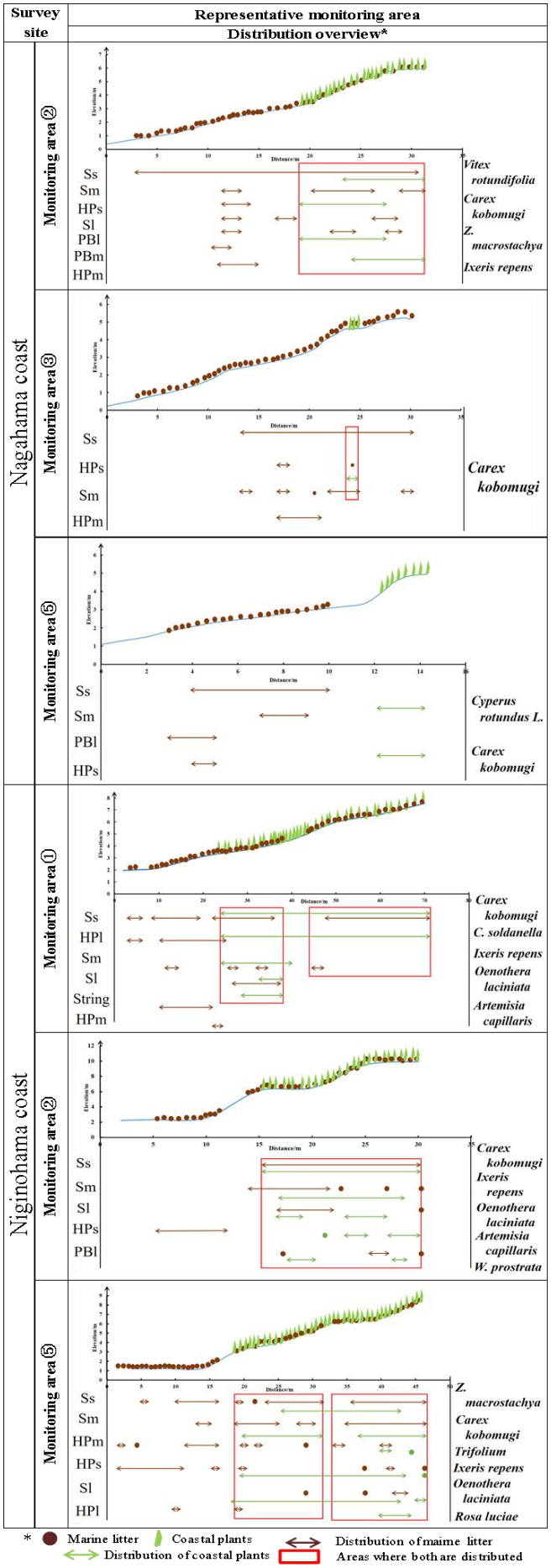

Fig. 3 Distribution overview in representative areas

monitoring area 5, the coverage of *Carex kobomugi* is almost the largest on Niginohama coast, and Styrofoam debris (<0.5 cm) can often be found where *Carex kobomugi* is distributed. In order to understand the distribution of marine litter and coastal plants on the coast more intuitively, I also used the terrain data obtained by drone photography to make coastal cross-section figures and summary figures of the distribution of marine litter and coastal plants on the coast cross-section of each monitoring area **(Fig. 3)**. Among the representative monitoring areas on Nagahama coast, monitoring area 2 has a relatively normal coastal topography, and the distribution area of coastal plants is larger than other areas. Monitoring area 3 is the most frequent entrance for human activities on Nagahama coast, the beach has a lower terrain than left and right due to being trampled on for a long time, making it more likely that marine litter would move inland because of wind, and the dune topography is unstable due to human activities, makes it difficult for coastal plants to root in the sand. The artificial revetment in the monitoring area 5 caused the terrain to drop sharply two meters away from the fence, which obviously restricted the growth range of coastal plants. Among the representative monitoring areas of Niginohama coast, monitoring area 1 has a wide range of beaches and topographical changes little, although coastal plants occupy a large area, marine litter is almost distributed in the entire monitoring area. Monitoring area 2 has a pristine natural coast features, facing the sea and back by the mountain, the topography changes obviously, and the distribution area of coastal plants is also limited by the beach area. The location of the revetment in the monitoring area 5 also has a sharp drop in terrain, which affected the distribution range of coastal plants.

3. Conclusion

After clarifying the distribution characteristics of marine litter and coastal plants on the coast section, the location of the artificial revetment obviously affects the coastal topography and the living range of coastal plants. The stability of the beach terrain has an impact on the survival of coastal plants. In areas with relatively flat beaches, the possibility of re-pollution caused by marine litter moving inland under the action of external forces is greater.