The classification of biotope type and characteristics of naturalized plant habitat on the coastal sand dune ecosystem

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Abstract
Coastal sand dune systems are particularly fragile and threaten the environment. However, these systems provide fundamental ecosystem services to the nearby urban areas, acting, for example, as protective buffers against erosion. In this paper, we attempt to classify the biotope types of coastal sand dune ecosystems and select an index for the assessment of the conservation value. The types of biotopes are categorized based on the vegetation map; floras are examined in order to research the effects of hinterlands on coastal sand dunes. In addition, a naturalization rate and an urbanization index for each biotope type in hinterlands are analyzed. In the ecosystem of coastal sand dunes, the urbanization index and naturalization rate shows a higher value in sand dunes with areas of road, residential, and idle land in farm villages, rice fields, and fields. On the contrary, a lower value in the urbanization index and naturalization rate is present when typical biotope types, such as sand dune vegetation and natural Pinus thunbergii forests, are widely distributed. Based on these results, urbanization index and naturalization rate should be used as critical indices for the assessment of the ecosystem of coastal sand dunes.

Key words: ecosystem assessment, naturalized plant, sand dune vegetation, urbanization index

INTRODUCTION

A coastal sand dune is an ecosystem distributed around the world. It is an ecological ecotone, where the features of coastal areas and the geographical, ecological features of land areas are both shown (Carter 1988, van der Maarel 2003, Walker et al. 2003). Endemic species forming a unique biota, different from the two ecosystems, frequently inhabit a coastal sand dune. In particular, many halophytes or sand dune plants ensuring high salt resistance grow in sand dunes; thus, unique sand dune vegetation, different from that of land vegetation, is formed (Kim et al. 1987, Kim and Ihm 1988). Since sand dune vegetation secures sand from sand beaches, prevents sand dunes from being eroded, and maintains scenery on coasts, its value for preservation is very high (Ministry of Environment 2001). These coastal sand dunes are very sensitive to external influences. Such external forces include coastal erosion and destruction of sand dune vegetation, topography due to unplanned development or immoderate sightseeing, and the destruction of coastal ecosystems due to the pollution of coastal sea areas. Under these external influences, coastal ecosystems are losing the unique features of coastal sand dune vegetation due to the introduction of naturalized plants and introduced species. In a broad sense, exotic species and naturalized plants are defined as invasive plants that invade a new environment after coming out of their habitats. Several reasons explain for the in-
To evaluate the uniformity, the range of the research areas includes 120,000 m² of coastal sand dunes. A length and width of 400 m × 300 m was set as the area for our research (Table 1). In order to research the vegetation and biotope types of the coastal sand dunes, research areas, along with the ranges, were selected.

The types of biotype in each research area were classified, and floras were examined by biotope types. Biotope classification means that all similar biotopes are reviewed, made into an abstract concept, and classified. This definition comes from a realistic point of view where it is easy to assess biotopes in an open field and thus, classification can be performed (Blab 1993). Therefore, biotope classification denotes the classification of biotopes with similar characteristics after reviewing biotopes in the target areas. First, a vegetation map was drawn and classified depending on habitats. The flora was categorized into vascular plants, halophytes, and naturalized plants. The flora of each biotope type was classified the naturalized plants based on the colored illustrations of naturalized plants of Korea (Park 1995, 2001) and the naturalized plants in Korea (Kim et al. 2000).

In order to analyze the naturalization rate and urban-