Relationship between seagrass bed dynamics and sandbar change as indicator of long-term environmental changes in Tokyo bay

Takehisa Yamakita[1]; Masahiro Nakaoka[2]; Akihiko Kondoh[3]

[1] Grad Sci&Tech Chiba Univ; [2] Grad School Sci & Tech, Chiba Univ; [3] CEReS, Chiba Univ.

http://life.s.chiba-u.jp/nakaoka/yamakita/

Deterioration of marine environment in coastal area is a serious concern in all over the world. Recently 'Law for the Promotion of Nature Restoration (Law No. 148, December 11, 2002)' went into effect in Japan. There are increasing social interests for nature conservation and for restoration of degraded ecosystems However, most of the ongoing conservation and restration efforts do not necessarily taken into account the underlying causes and mechanisms of environmental deterioration, which may end up with transient symptomatic therapy. To overcome these problems, we first need to monitor long-term changes of the ecosystem quantitatively to clarify the scale-dependency in the observed phenomenon and their causes. In Tokyo Bay, effects of landfill and water pollution on environmental deterioration have been pointed out. Water quality has been monitored since 1960's when pollution was recognized as a social problem. However, very few studies have been carried out that quantify changes in ecosystem in broad spatial scales. Remote sensing approach using images taken in the past can be one of the effective investigation tool to follow up past environmental changes.

To clarify the long-term environmental changes in Tokyo Bay, we studied fluctuation pattern of seagrass bed and sandbar around Futtsu Cape in Tokyo Bay, and examined relationships between environmental changes and other biological changes . We first compared interpreted and classified aerial photographs to field census data to check the accuracy of classification and biases among different classification methods. We then analyzed relationships among seagrass vegetation area, position of sand bar, water quality and weather conditions.

Comparisons with field census revealed that seagrass distribution was recognized with an accuracy of 70% from the aerial photographs, although the distribution of three species (Zostera marina, Z. caulescens and Z. japonica) was not discerned. The seagrass bed significantly extended to offshore in 1970's, reaching a maximum of 1.79 km2 in 1986. After that, the area fluctuated and decreased to a minimum of 0.60 km2. Temporal change in seagrass area did not correlated to that in water quality, whereas retreat of offshore borders of the seagrass bed corresponded well with fluctuation in location of sand bar. Thus, long-term spatial dynamics of the seagrass bed in physically-exposed Futtsu tidal flat is strongly influenced by physical processes. In this presentation, we present data analyzed at 1-yr intervals and discuss its temporal pattern in relation to long-term environmental changes in whole Tokyo Bay area.