

Estimation of temperature of seaweed bed vegetation boundary in the Western Seto Inland Sea using satellite SST

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Seaweed bed is algal community in the coastal region, and important for the coastal fishing. It provides various ecosystem services to human society. However, it has been changing seriously, especially in the species and composition and habitat. Therefore, vegetation and distribution of seaweed in the near future is regarded as uneasiness by fisher men. Although several studies had reported the changes associated with the warming of sea surface temperature due to the climate change, they have some problems, such as low spatial-temporal resolution for the coastal region. Moreover, the boundary temperatures of the seaweed vegetation are not clear. In this study, I investigated the boundary temperature of seaweed vegetation in the Bungo Channel by using a satellite sea surface temperature data set (NOAA/AVHRR Pathfinder version 5.3 level 3 collated global 4km sea surface temperature) which had enough resolution for the coastal region. The Bungo Channel has large gradient of sea surface temperature and various seaweed vegetation. First, I analyzed the accuracy of the satellite temperature in this region by comparing with ship board observation. The result shows that the accuracy of the satellite temperature in winter is enough high (RMSE<0.74°C), while the accuracy in summer is relative low (RMSE<1.25°C) compared with those in winter. Secondly, I analyzed the time series of the temperatures of three boundaries of seaweed vegetation both winter and summer. One is the restrictive temperature of the southern limit of temperate kelps habitat. Second is the restrictive temperature of the southern limit of the other temperate seaweeds habitat. Third is the restrictive temperature of the southern limit of the transition region between temperate and subtropical seaweeds (i.e., the northern limit of subtropical seaweeds). I found that the restrictive temperatures in winter were 14.5°C, 15.0°C, 16.0°C, and also the restrictive temperatures in summer were 26.0°C, 26.5°C, 27.0°C, respectively. The restrictive temperature of the southern limit of temperate kelps moved northward from 1989 when the winter temperature have been over 14.5°C. It was also affected by warm summer temperature changing in the 2000s. The restrictive temperature of the southern limit of the other temperate seaweed habitat was considered to be strongly affected by the warm winter temperature over 15.0°C after the 1990s. Invasion of the subtropical seaweed seemed to be related with the disappearance of the temperate seaweed which lived in there after the 1990s.

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