Biological Invasions as a Cause of Irreversible Change

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Land cover change, global warming by CO_2, chemical contamination, and introduction of non-indigenous organisms, are all threats to original ecosystems on the Earth. Ecological succession usually erases footprints of human land use, and contaminated chemicals in the environment will be decomposed after several years. Invasive non-indigenous species, however, reproduce themselves and persist. New invading species will change the nature of forests, rivers and lakes in the future.

Intentional introduction of non-indigenous species (erosion control, horticulture, zoo, etc.), often cause invasion into wilderness areas. International commodity trade causes unintentional introduction of weedy species and oceanic species. The naturalized organisms disperse themselves. In the case of green crabs from Europe (*Carcinus aestuarii*), we detected natural dispersal and secondary transport by coastal shipping, but transport by international ocean-going shipping was not statistically significant, suggesting quite a small immigration probability of the crab by long voyages.

Japanese people thought wilderness areas as valuable ecosystem before 1980s, however; people began to consider traditionally managed rural landscape (satoyama) as valuable after 1980s. Some of traditional flora in rural landscapes are considered as an ancient non-indigenous plant from China. We consider newly introduced species after the end of long seclusion (Meiji Restoration) as the species to control.