

Disease ecology of ticks and wildlife: One Health and wildlife management
perspectives

Abstract of Doctoral Thesis

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Recently, the association of wildlife on tick-borne diseases has been suspected. For tick-borne diseases prevention and vector control by ecosystem management, it is necessary to understand the distribution of ticks, the influence of urban wildlife, and the relationship between wildlife and ticks on pathogens.

In this study, we surveyed the tick fauna in the western Kanto region (90 x 180 km) using the flagging method, and predicted the distribution of nine major tick species throughout the study area using the MaxEnt model with background information on land use, climate conditions, and wildlife distributions at tick present sites. Forest continuity contributed 18.6-51.1% to seven tick species in the land use factors, and raccoons contributed 7.3-19.1% to six tick species in wildlife distributions.

We investigated ticks dispersed by raccoons, and raccoon dogs, and masked palm civets (Here after, civets), the wildlife which ecological niches overlapped with the raccoons. The evaluated tick dispersing ability based on infestation intensity, removal ability, and resource selection index of ticks. A study in Kanagawa Prefecture comparing raccoons and civets indicated that civets are Ecological Traps with high tick removal ability, while raccoons are Ecological Boosters that can spread ticks. A host selectivity study in Gunma Prefecture comparing raccoons, raccoon dogs, and civets indicated that more tick species selected raccoons and raccoon dogs as the hosts. In addition, although raccoons and raccoon dogs have overlapping habitats, raccoons, which use urban areas more frequently, were thought to be more likely to spread ticks into human dwellings.

By investigating changes in the tick fauna in areas where deer and wild boars, which are considered to be factors of tick distributions, were introduced. *Haemaphysalis megaspinosa* was introduced together with deer and became the dominant species in Niijima, Izu Islands. In Kanagawa Prefecture, where wild boars were introduced, *Amblyomma testudinarium* and *H. hystricis* were introduced together with wild boars, and we found that these two ticks infested the raccoons within 4-7 years of the tick introduction.

An ELISA test for Kabuto mountain uukuvirus-like virus (KAMV) indicated that antibody prevalence in raccoons was affected by habitat suitability of *H. flava* as calculated by the MaxEnt model. The geographic distribution of the probability of KAMV antibody positive raccoons was projected on a map using logistic regression curves.

This study suggested that raccoons are the tick-spreading urban wildlife and that priority measures are needed. The impact of wildlife on the tick fauna should be surveyed at least every three years, and that widespread and uniform monitoring strategy is necessary.