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Tropical Deforestation Affects Long Term Persistence of Sumatran Tiger: A Modelling Study

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Abstract

Roads development has been used to explain pattern of deforestation in tropical area. Roads divide tropical forest into several forest fragments and leads to isolation for wildlife. The presence of road provides good accessibility for predator such Sumatran tiger as well as its preys. However at the same time, roads increase probability of animal being exposed to human and consequently increase mortality. Do roads development could be used to explain mortality of tiger and its prey? Do Sumatran tiger survive in the presence of roads encroachment in protected area?

We investigated deforestation through pattern of road development within Tesso Nillo national park during 1982 to 2005 from satellite images. We used the results as input for our individual-based model of Panthera Population Persistence / PPP describing population dynamics of Sumatra tigers spatially explicitly in order to provide better understanding on mechanistic effects of deforestation on this endangered animal. The model considers tiger reproduction, feeding behaviour, and prey dynamics. The importance of each process and parameterisation was extensively tested by sensitivity analyses using improved Morris method. We simulated the development of main road, as well as logging roads in three different scenarios basing on the observations in the national park. The time horizon of the simulations was 15 years. The effect of the different scenarios on the number of death tiger and its prey was assessed, and a ranking list was compiled serving as recommendation list for a decision support system to be developed in the future.

Keywords: Deforestation, individual-based model, Sumatra tiger, wildlife