

Using 10 years' survey data to assess environmental variables associated with the distribution of Sumatra rhino in Sabah, Malaysia

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Effective conservation of endangered species needs a thorough understanding of their basic requirements. The Sabah rhino (*Dicerorhinus sumatrensis harrissonii*) is a critically endangered subspecies of the Sumatra rhino. Less than 20 individuals are estimated to exist in the wild. The largest proportion of this subspecies occurs in the northern tip of Borneo, in the East Malaysian state Sabah. Here two separate rhino populations exist, one living in the Tabin Wildlife Reserve and the other one in the Danum Valley Conservation Area. The habitat of the Sabah rhinos is the lowland rainforest, which is characterised by a high diversity in flora and fauna. The majority of these forests have been selectively logged in the past and converted into oil palm plantations. The remaining pockets of lowland rainforests are surrounded by oil palm plantations, preventing any reproductive contact between populations. Virtually no information is available about the exact number of rhinos, their sex, age, movement patterns, habitat requirements or reproductive behavior. This lack of information about basic population and life history parameters is largely owing to the inaccessible rainforest habitat and the rhinos' secretive lifestyle.

We analyzed long-term data collected by field rangers during their monthly surveys in the Tabin Wildlife Reserve between 2000 and 2013 to assess environmental factors associated with the presence of Sabah rhinos. The presence of rhinos was indirectly measured by recording GPS positions of footprints, feces and feeding signs. We used a 'use v. availability' approach and selected environmental predictor variables, such as distance to streams, roads, human presence as well as vegetation type, calculated from satellite data, according to their potential biological relevance for the Sabah rhino. Model selection followed an information theoretic approach, and the best model was used to approximate the potential number of the rhino population in Tabin. This estimation will form the basis for a population viability assessment which can be used to take sound and specifically targeted management decisions.

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