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Potential impacts of climate change on stable flies, investigated along an altitudinal gradient

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Abstract

Adult populations of two species of stable flies were sampled along an altitudinal transect to determine whether higher temperatures resulted in (i) increased fly numbers, (ii) a longer season of infestation, and (iii) different responses in the cosmopolitan Stomoxys calcitrans and the tropical Stomoxys niger niger. Flies of both species were trapped at seven farms located at four altitudes (from 1600 to 100 m a.s.l.) in Reunion island. Trapping occurred once weekly over a 90-week period.

In either species, there were no relationships between the maximum or mean fly abundance and altitude. Only minimum abundance in winter increased significantly with decreasing altitude. Maximum and mean abundances differed significantly between nearby farms under similar climatic conditions. S. calcitrans was overall the most abundant species, but the proportion of S. niger significantly increased with decreasing altitude and became predominant at 100 m a.s.l. In both species, there were marked seasonal fluctuations in abundance, which changed along the gradient. When altitude decreased, population growth started earlier in winter but abundance declined earlier in summer, which resulted in a shift, not a lengthening of the season of infestation. Seasonal fluctuations of both species were strongly related to climate variables at high altitude, mainly temperature (positive relationship) and relative humidity (negative relationship). However, climate variables explained a decreasing proportion of the variations in abundance with decreasing altitude.
Synthesis and applications. The results indicate that (i) the maximum abundance of stable flies is limited by local factors, probably larval resources, and should not increase in response to climate warming; (ii) relationships between stable fly abundance and climate variables deteriorate when climate changes, which does not permit accurate predictions of population changes using climatic models; (iii) the tropical species tends to be the predominant pest at elevated temperatures, and it is recommended not to introduce S. niger in areas where climate is changing and where its other habitat requirements are met.