**Modeling the geographic distribution of *Ixodes scapularis* and *Ixodes pacificus* (Acari: Ixodidae) in the contiguous United States**

Supplemental File – variable candidates and additional information on variable selection

**List of variables considered for inclusion in the habitat suitability models**

*19 Bioclim variables*

* BIO1 = Annual Mean Temperature
* BIO2 = Mean Diurnal Range (Mean of monthly (max temp - min temp))
* BIO3 = Isothermality (BIO2/BIO7) (\* 100)
* BIO4 = Temperature Seasonality (standard deviation \*100)
* BIO5 = Max Temperature of Warmest Month
* BIO6 = Min Temperature of Coldest Month
* BIO7 = Temperature Annual Range (BIO5-BIO6)
* BIO8 = Mean Temperature of Wettest Quarter
* BIO9 = Mean Temperature of Driest Quarter
* BIO10 = Mean Temperature of Warmest Quarter
* BIO11 = Mean Temperature of Coldest Quarter
* BIO12 = Annual Precipitation
* BIO13 = Precipitation of Wettest Month
* BIO14 = Precipitation of Driest Month
* BIO15 = Precipitation Seasonality (Coefficient of Variation)
* BIO16 = Precipitation of Wettest Quarter
* BIO17 = Precipitation of Driest Quarter
* BIO18 = Precipitation of Warmest Quarter
* BIO19 = Precipitation of Coldest Quarter

*2 measures of Growing Degree Days (GDDs) >10°C*

* Mean monthly GDDs >10°C
* Cumulative GDDs >10°C for each month

*Other variables*

* Monthly average vapor pressure
* Average number of days per month with snow cover
* Elevation
* Percent forest cover in a county

Two of the variable selection methods were based on the deviance explained by each variable in a univariate generalized additive model using the presence / absence data as the outcome. As discussed in the methods section, for these variable selection methods, variables with the highest deviance explained were retained for the final models and other correlated variables were dropped. For the expert opinion model, variables were selected based on the percent deviance explained, correlation with other variables, and our knowledge of tick biology. For example, temperature seasonality (Bio4) was not retained in the final *I. scapularis* model because it had a lower deviance explained and was highly correlated with other variables retained in the model such as mean temperature of the coldest quarter (Bio11). Similarly, temperature annual range (Bio7) was dropped because it had a low deviance explained relative to other variables retained in the model and measures of extreme heat and cold, which are shown to be related to heat-induced desiccation of ticks (Balashov 1971, Sonenshine and Roe 2013, Eisen et al. 2015) and tick survival during the winter (Vandyk et al. 1996, Eisen et al. 2015), respectively, were captured with other variables (e.g. max temperature of warmest month (Bio5) and mean temperature of coldest quarter (Bio11) that were correlated with Bio7 and had higher deviance explained.

**References cited**

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**Sonenshine, D., and R. M. Roe**. **2013**. Biology of Ticks, 2nd ed. ed. Oxford University Press.

**Vandyk, J., D. Bartholomew, W. Rowley, and K. Platt**. **1996**. Survival of *Ixodes scapularis* (Acari: Ixodidae) exposed to cold. J. Med. Entomol. 33: 6–10.