Research in Progress

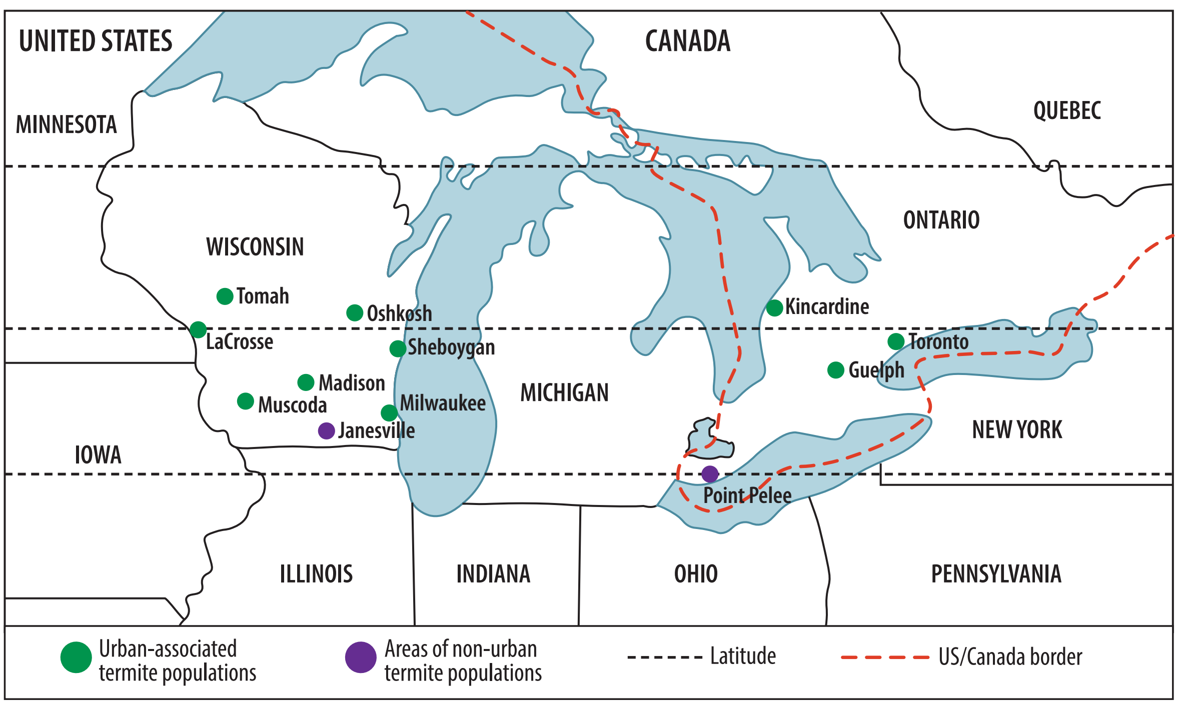
Forest Products Laboratory

Cold Tolerance Adaptations in the Eastern Subterranean Termite, *Reticulitermes flavipes*

Subterranean termites are responsible for billions of dollars in damage to structures annually in North America (Bulmer et al. 2009), with the eastern subterranean termite *Reticulitermes flavipes* (Kollar) considered the most commonly encountered species. Although subterranean termites are most prevalent in the southern United States, certain species of *Reticulitermes* have been introduced and become established in regions further north in the United States and Canada. Various researchers have attempted to examine thermal tolerance in these introduced populations, but much remains unknown regarding their physiological adaptations to cold.

Background

In Wisconsin, the role of climate, specifically low winter temperatures, has long been hypothesized to restrict establishment of termite populations (Esenther 1969). Understanding various adaptations that influence the ability of subterranean termites to survive in colder climates is important for predicting the potential spread and future economic impact of subterranean termites, particularly in conjunction with changes in global climate conditions (Bale 2010).



Simplified map showing the northern distribution of *R. flavipes* along its northern range. (Only selected populations are shown to highlight major zones of activity.)

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Objective

The main objective of this work is to characterize cold tolerance adaptations in subterranean termites by directly comparing northern and southern populations of *R. flavipes* in hopes of better understanding how termite populations are able to survive and establish in introduced regions.

Approach

In this study we will first examine basic differences in cold tolerance between *R. flavipes* from Wisconsin and Mississippi populations, specifically critical thermal minimum, supercooling points, and lower lethal limits (or LT50). Second, behavioral assays will be used to evaluate strategies for cold tolerance (such as reduced feeding, tunneling activity). Then molecular techniques will be used to investigate genetic differences in cold tolerance (such as gene expression, cellular lipid/amino acid content). By running concurrent tests between Wisconsin and Mississippi, we hope to directly compare differences in cold tolerance at the two extremes of *R. flavipes* distribution.

Expected Outcomes

Results from this study will be compiled and submitted to a scientific journal for publication and also presented at a national scientific conference. We hope that this study might provide the framework for examining thermal tolerance adaptations in other studies involving the potential distribution of invasive organisms.

Timeline

Method development, including building of testing chambers and preliminary testing of equipment and molecular reagents, will be completed by May 2017, coinciding with the start of the termite season. Data will be collected from the end of May to the end of August or September during both 2017 and 2018. Data analysis will be completed by May 2019, unless further experimentation is required.

Cooperators

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