Referenced Research Abstract presented at two meetings and three Universities

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Species Boundaries and Hybrid Zones of a Recently Diverged Species Complex

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Speciation is the biological process of one species splitting into two or more new species, and is the driving force of biodiversity on Earth. When such new species are formed, there are three different ways in which their populations can be distributed relative to each other. They can be sympatric, where species boundaries overlap one another; parapatric, where species boundaries line up along each other's edges; or allopatric, where the species boundaries do not come in contact with each other.

In the Marshall Laboratory, we are interested both in how environmental variables like temperature and moisture influence species distributions (Camp and Marshall 2000; Jensen, Camp, and Marshall 2002; Marshall and Camp 2006; Camp, Huestis, and Marshall 2007) and how closely related species interact at the boundaries of their distributions (Howard et al 2003; Traylor et al. 2008). The combination of these two interests motivated this study. Specifically, we were interested in the *Allonemobius socius* complex of crickets, which is comprised of four closely related species (i.e., *A. socius*, *A. fasciatus*, *A. sp. nov.* Tex, and *A. shalontaki*) whose species boundaries are unresolved in the central United States. This complex of crickets has been a model in evolutionary biology, used to study speciation (Howard et al. 2002; Marshall, Arnold, and Howard 2002; Marshall et al. 2011; Marshall and DiRienzo 2012; Marshall 2013), hybrid zones (Howard et al. 2003; Traylor et al. 2008), genetics (Huestis and Marshall 2006a; Britch et al. 2007; Huestis and Marshall 2009; Huestis, Oppert, Marshall 2009; Marshall et al. 2009), behavior (Huestis and Marshall 2006b; Birge et al. 2010), and sexual conflict (Hayashi, Marshall, Gavrilets 2007; Marshall 2007; DiRienzo and Marshall 2013).

Here, the goal of this research project was to assess the physical and ecological distribution of these species in the central United States and determine whether or not there are areas of sympatry. To accomplish this, we created eight transects over five states (Nebraska, Kansas, Missouri, Texas, and Arkansas), and collected 10-30 crickets every 100 km on those transects. Next, we genetically screened all individuals for two diagnostic allozyme loci (*Mdh* and *Idh*; Huestis and Marshall 2006; Huestis, Oppert, Marshall 2009) and several AFLP markers (Howard et al. 2002). We also conducted hybrid index analyses for locations where multiple species were collected. We found that species were patchily distributed along their boundaries and that the hybrid zone between *A. socius* and *A. sp. nov.* Tex (Marshall 2004; Traylor et al. 2008) extends well into Oklahoma. Moreover, there is evidence of a new species in Missouri and northern Arkansas. More research is needed to define the number and distribution of species in this rapidly evolving complex of crickets.

*Undergraduate research presented at 2 meetings and 3 Universities:

2012 **NSF-REU Summer Program Symposium**. Title: Species boundaries and hybrid zones of a recently diverged species complex. Desiree Harpel (**undergraduate**), presenter. **Kansas State University**. Manhattan, KS.

2012 **Ecological Genomics Symposium**. Title: Species boundaries and hybrid zones of a recently diverged species complex. Desiree Harpel (**undergraduate**), presenter. Kansas City, KS.

2013 **University of Boston**, Sean Mullen's Research Group. Title: The identification of zones of secondary contact in a cricket hybrid zone. Desiree Harpel (**undergraduate**), Interview Seminar. Boston, MA.

2013 **University of Kansas**, EEB group. Title: The identification of zones of secondary contact in a cricket hybrid zone. Desiree Harpel (**undergraduate**), Interview Seminar. Lawrence, KS.

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