

Pygmy mole crickets and other relatives (Orthoptera: Caelifera) from Nachusa Grasslands

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Introduction

Pygmy mole crickets (Tridactylidae), pygmy grasshoppers (Tetrigidae) and relatives belong to the group of grasshoppers with short-antennae, known as Caelifera. The pygmy groups are distributed worldwide in riparian habitats or areas with high moisture. Fifty-four caeliferan species and subspecies are known to occur in Illinois; only two are pygmy mole crickets and ten are pygmy grasshoppers.¹

Biology and ecology: These insects are reported to feed on algae and/or detritus.^{2,3} Terrestrial and semiaquatic invertebrates that inhabit riparian zones, shorelines, and riverbeds of "intermittent rivers and ephemeral streams" are important not only for their role in nutrient cycling, but they also help the infiltration of water to the ground by removing the soil through digging and tunneling; in addition, they serve as a food source for riparian organisms.⁴ Even though Steward et al. (2017) focuses on ephemeral streams, it could apply for other aquatic environments and their riparian organisms.

Conservation status: The data distribution is deficient for these groups, and their conservation status has not been evaluated. In Illinois, the species *Nomotettix parvus* (Low-Ridged Pygmy Grasshopper) was listed in the Illinois Wildlife Action Plan⁵ as needing further research.

Goal: Here, we surveyed the presence of habitat specialized orthopterans (with an emphasis on pygmy grasshoppers and pygmy mole crickets) at Nachusa Grasslands.

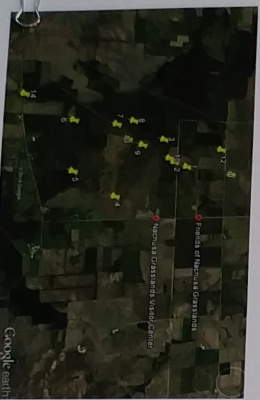


Figure 1. Map of Nachusa Grasslands with selected sites for sampling

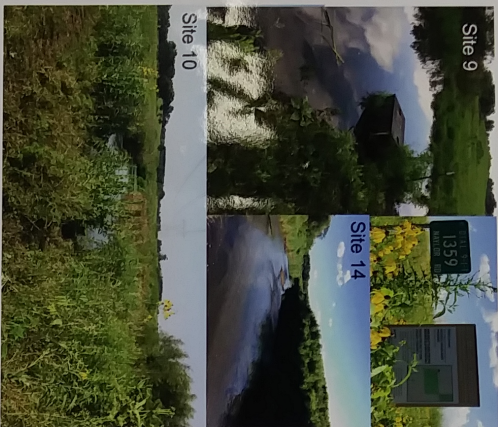


Figure 2. Sites with adjacent water sources where we located pygmy mole crickets (Tridactylidae)

Methods

Visits to Nachusa Grasslands were performed in March, May, July, and August 2018. Sites for sampling were selected in March (Fig 1 and 2).

Collection procedure: Over a period of 2-3 days each site was visited at least once. At each site, caeliferans were collected by sweep-net. Additionally, direct observations of pygmy mole crickets and manual collecting took place at sites with water sources. Grasshoppers (Acrididae) were placed in vials on ice to preserve coloration. Pygmy mole crickets were placed in vials with 100% ethanol for DNA preservation. All samples were frozen and transported to the Heads Laboratory at the Natural Resources Studies Annex (NRSA) for further identification and curation. Upon arrival, samples were stored. Orthopteran samples were sorted and identified to suborder and family. Pygmy mole crickets were identified to genera. Notes of sex of the individuals (female, male, unknown), and stage of development (nymph or adult) were added.

Preliminary data

We found 150 specimens from the order Orthoptera. From these, 137 are short-antennae grasshoppers in the families Tetrigidae, Acrididae and Acrididae (Table 1).

Table 1. Summary of sorted orthopterans.

Order	Family	Male	Female	Adult	Nymphs
Ensifera					12
Caelifera	Acrididae	22	14	36	45
	Tetrigidae	3	3	6	3
	Tridactylidae	8	5	13	31

Orthopterans were found in all sites, except 8 and 11 (these sites were visited only once during the season). Pygmy mole crickets were collected from three sites (9, 10, and 14) (Fig 2). Pygmy grasshoppers from six sites (2, 6, 7, 9, 10, and 13), other short-antennae grasshoppers were found from almost all sites, except for 8, 9 and 11 (Fig 1). All pygmy mole crickets samples were identified as *Ellipses aff. minuta minuta*, but further analysis is required.



Figure 3. A. Pygmy mole cricket adult and nymph (Tridactylidae). B-D direct observation of pygmy mole cricket tunnels. Specimen in circle.

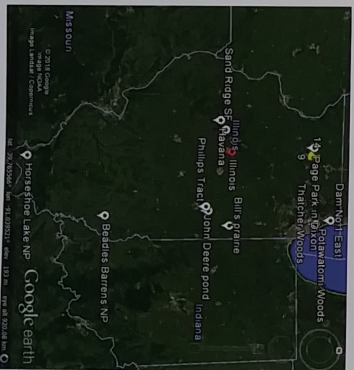


Figure 4. Map of Illinois with sites where we located pygmy mole crickets in 2017 and 2018. Star: *Neotridactylus*. Circle: *Ellipses*.

Significance

The fact that we are finding these crickets in Nachusa Grasslands generates important questions about how are they dispersing and colonizing new areas. Their range of dispersal may be larger than we originally predicted.

Observation of these organisms in the field is not only difficult due to their size, but also their cryptic coloration. However, these organisms play a significant role in the nutrient cycling by processing nutrients and decaying matter.

Future work

The second goal of this project is to use molecular techniques in the measurement of divergence and delimitation of populations and species of pygmy mole crickets and cicadas from Nachusa Grasslands and other localities in Illinois. In order to accomplish this, molecular analysis of samples will be done over the next few months. Pygmy mole cricket samples from sites 9, 10 and 14 will be compared. This could provide information about the divergence of these populations. Further comparison with samples across Illinois (Fig 4) could help on the delimitation of species in the state. This could help us understand how these organisms are moving, and allow us to provide a clear status of conservation and how the data is deficient and their current distribution is unknown.

Acknowledgments

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