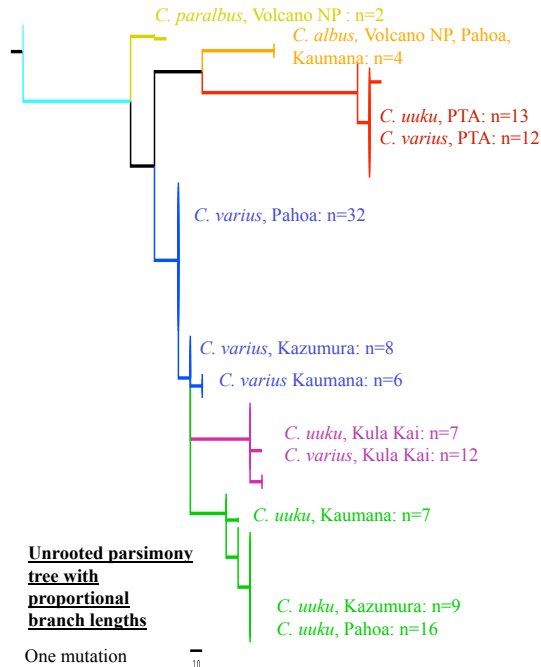


Introduction

Four species of cave adapted crickets in the genus *Caconemobius* have been described from Big Island caves (*C. uuku*, *C. varius*, *C. albus*, and *C. paralbus*), based on morphology. These crickets are scavengers that depend mainly on cave tree root communities (primarily native *Metrosideros*) for survival.

This research uses mtDNA (COI) sequencing, morphology, chromosome number, number of sex chromosomes, and capture method as a behavioural characteristic (based on ability to detect light and avoid it, and ability to avoid pitfall traps) to determine number of cave crickets and their ranges.



Results

--In East Hawai'i (Kaumana, Kazumura, Paho), *C. uuku* and *C. varius* are clearly separate genetically, morphologically and behaviorally.
--In South Hawai'i (Kula Kai), *C. uuku* and *C. varius* fall within one clade genetically, and are less clearly separated morphologically and behaviorally than in East Hawai'i.
--In West Hawai'i (PTA) *C. uuku* and *C. varius* fall within one clade genetically (distinct from the South Hawaii clade), and are also less clearly separated morphologically and behaviorally than in East Hawai'i.
--In East Hawai'i, *C. uuku* and *C. varius* have distinct chromosome numbers and sex determining mechanisms. In South Hawaii, they are all like *C. varius*. This is not known for West Hawai'i crickets.
--The tree reveals possible hybridization or multiple species, more sampling is needed to determine whether *C. albus* and *C. paralbus* are more widely distributed.

Conservation of cave adapted crickets depends on:

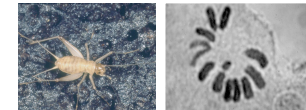
1. Determining how many species of *Caconemobius* cave crickets occur on Hawai'i Island.
2. Deciding whether the species assignments are consistent using molecular, chromosomal, morphological and behavioral data.
3. Knowing the range and habitat (including surface ecosystems) of each species.
4. Understanding the threats to each species.



Methods

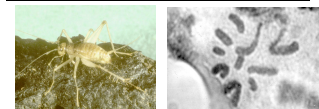
--Crickets were collected from Hawai'i Island caves by hand and pit fall traps. Upon collection they were stored in 95% ETOH.
--DNA was extracted from collection using full scale method (Qiagen DNeasy Kit). DNA from species *albus* and *paralbus* was isolated by Henrietta Croom, and borrowed from Bishop Museum.
--Mitochondrial gene cytochrome oxidase subunit I (COI), 554 bp region, was amplified using PCR with COI primers, and gel electrophoresis to identify target DNA.
--Amplified DNA fragments were analyzed by direct sequencing. Results of the sequence data is reflected in the parsimony tree.

C. varius: caves and mesocaverns, Hilo and Puna



--Can detect light and establish circadian rhythm
--2n = 12: 6 chromosome pairs
Sex determination: XX/XO

C. uuku: deep caves and deep mesocaverns, Hilo and Puna



--Blind, no circadian rhythm
--2n = 10: 5 chromosome pairs
Sex determination: X₁X₁X₂X₂ / X₁X₂Y
Loss of chromosome pair, new sex determining mechanisms

C. varius & *C. uuku* from South Hawai'i and West Hawai'i can't be distinguished using COI, and may represent different species in each of these areas

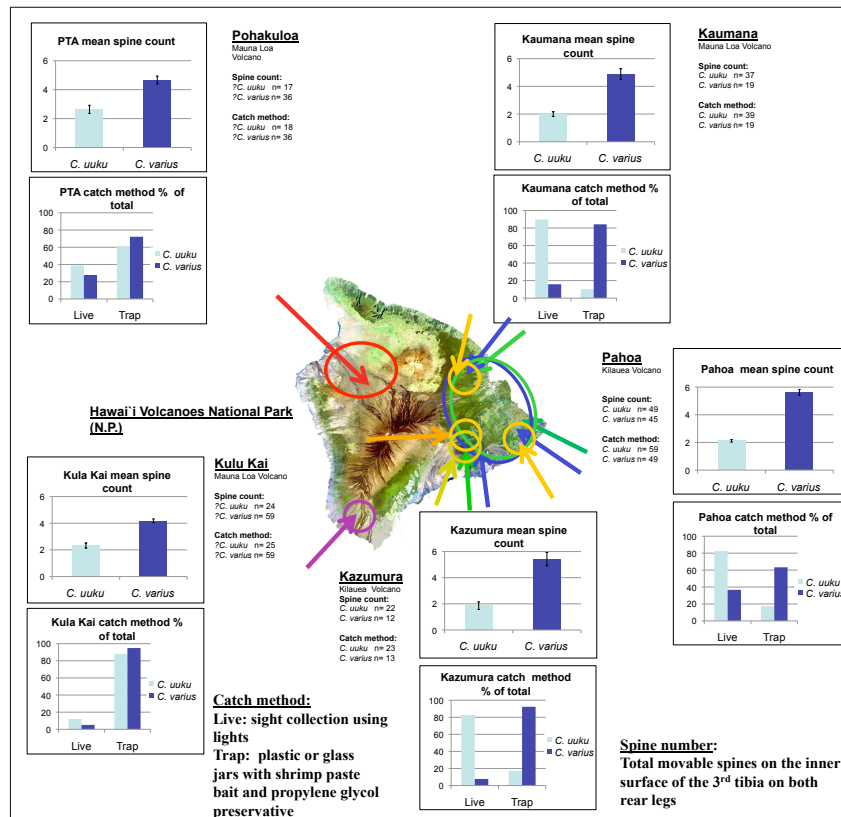
C. albus: caves, Volcano, Hilo, Puna

--Caves in Volcano N.P. and a few caves in Hilo and Puna. Not abundant, chromosome number and sex determination not yet determined.

C. paralbus: caves, Volcano N.P.

--Found in a few caves in Hawai'i Volcano NP;
--Not abundant; further studies needed to determine ranges, chromosome number, sex determination

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Threats to cave crickets:

--Loss of native surface ecosystems that provide the tree roots (particularly *Metrosideros polymorpha*) that are the basis for cave communities is the major threat to survival of cave crickets. The solution, once the species and their ranges are determined, is to work toward protection of major native surface ecosystems overlying the caves and mesocaverns.
--Introduced competitors (cockroaches) and predators (rats) are another major threat. This threat is more difficult to manage, since the potential habitat is vast. At best, control methods in local cave reserves could be instituted for larger predators such as rats. Arthropods such as cockroaches are harder to control, since many control methods also target the native crickets and other cave arthropods.