Evolution of multiple queen breeding and social parasitism in South American leaf-cutting ants

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Background

Social parasitism is a kind of symbiotic interaction in which a parasitic species
(i) exploits the social structure of its host species
(ii) depends on its host for reproduction.

In evolutionary biology, it is debated whether social parasites evolve in sympatry or in allopatry from their host species?
Also, under what social conditions do social parasites evolve?

Hypothesis

The presence of multiple reproductively active queens in a colony provides the social conditions favoring the evolution of social parasites.

Research Question

Do *A.heyeri* colonies demonstrate polygyny?

Geographic Distribution

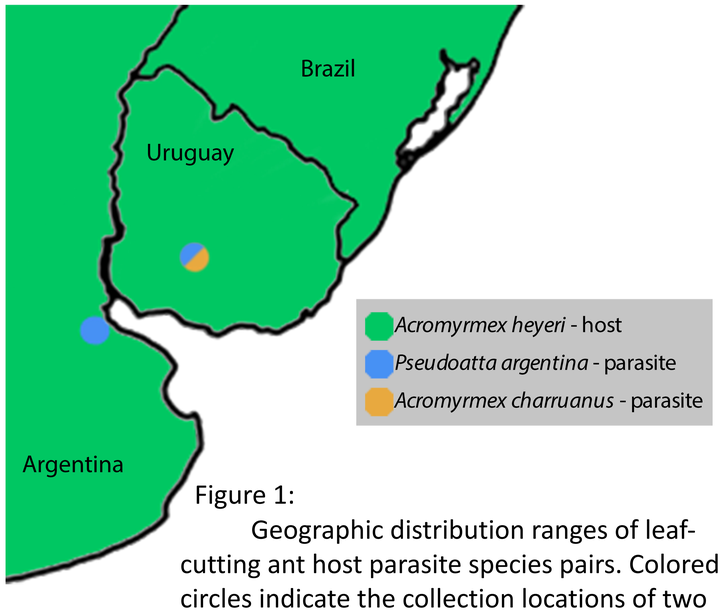

Figure 1:
Geographic distribution ranges of leaf-cutting ant host parasite species pairs. Colored circles indicate the collection locations of two parasite species.

Study Organisms

Acromyrmex charruanus - Parasite

Acromyrmex heyeri - Host

Pseudoatta argentina - Parasite

A. heyeri is the host species for two social parasites, *A. charruanus* and *P. argentina*.

Methods

DNA Extraction

48 individuals were sampled from 10 different colonies of *A. heyeri*.

Microsatellite Markers

8 highly polymorphic microsatellite genetic markers were used to genotype individual workers, males and queens from each colony.

Fragment Analysis

Genotypes were analyzed using Geneious v.8 genetic analysis software.

Queen Genotype Reconstruction

Utilizing the offspring's genotypes, likelihood analyses were used to reconstruct the number of likely queens and their genotypes for each colony.

Results

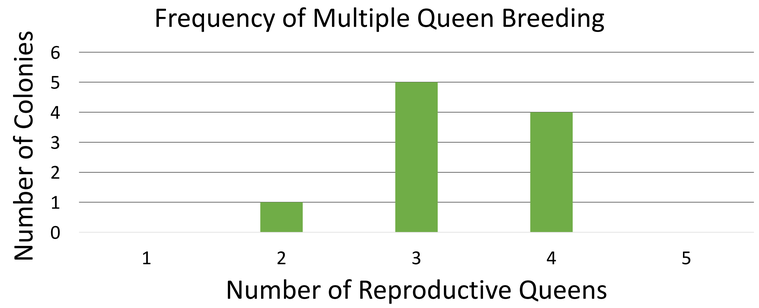

Figure 2: All analyzed *A. heyeri* host colonies were polygynous, with 2-4 reproductive queens (*n =10*)

Discussion

A. heyeri colonies from our study population in Uruguay have multiple reproductively active queens, and are functionally polygynous. Our results are consistent with the hypothesis that multiple queen breeding provides the social environment under which social parasitism can evolve. This hypothesis is supported by the occurrence of two known social parasite species in the *A. heyeri* host population.

Outlook

i) Increasing the sample size for *A. heyeri* samples.
ii) Analyzing colonies with known number of reproductive queens to compare the power of the statistical analyses with a definitive null hypothesis.

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