

Determining the Evolutionary Relationships Between Parasitic Ants and Their Host Species

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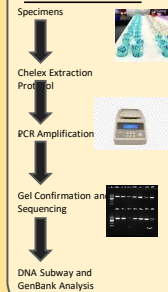
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Introduction:

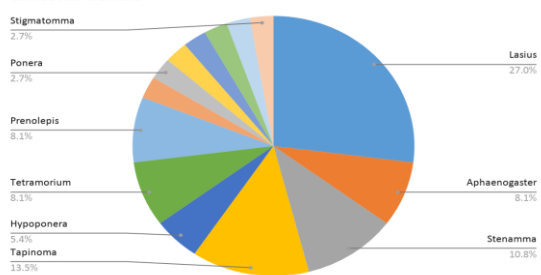
Contrary to popular belief, ants are not all household pests, but a staple of our local environment. Just like many other organisms, some ants exhibit very peculiar and complex behaviors. One of these behaviors is parasitism. There are three main types of parasitism that only a small number of ants (around 300 species) display. These types are temporary, dulotic, and inquiline parasitism. In temporary parasitism, an imposter queen ant will camouflage herself using pheromones to infiltrate a host colony, and kill the host colony's queen. She will then take control of the host colony by convincing the workers she is the true queen. Dulotic ants on the other hand take a more direct approach. Commonly called the slave-making ants, ants that exhibit this behavior will raid host colony nests and steal the young of the host species, chemically imprinting upon them, and assimilating them into their colony. Finally in inquiline parasitism, the inquiline queen will infiltrate a host nest and climb onto the back of a host queen. By doing this, the inquiline queen's eggs are raised as if they were the host queen's eggs. This research project was developed to help clarify some of the gaps in knowledge for the parasitism exhibited by some ants with the final goal being to use DNA barcoding to target cytochrome oxidase I (CO1) in order to explore the evolutionary relationships between representatives of these parasitic modalities and their hosts.



Methods:



Collected Genera



Hypoponera punctatissima (PMQ-012)



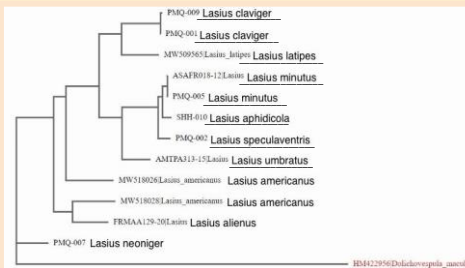
Lasius brevicornis (PMQ-030)



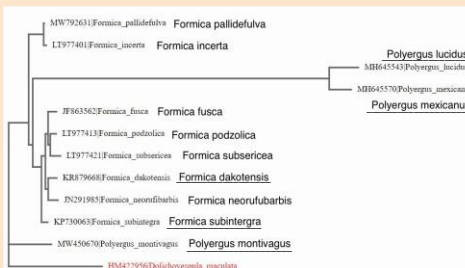
Stigmatomma pallipes (PMQ-038)
(Photo courtesy of @maxhikephotography)



Myrmica sp. (PMQ-015)

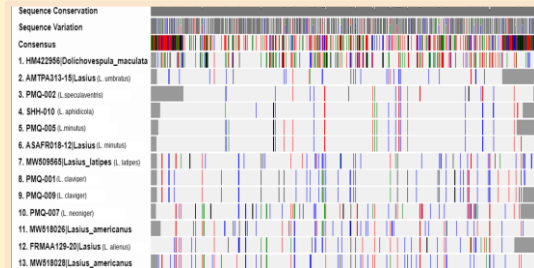


(Figure 1.): Using the CO1 gene region, the differences between temporary parasites and their hosts were determined. Unsurprisingly many are closely related to their hosts. The results were determined using the CO1 region in the mitochondrial DNA and comparing the samples, from BOLD, GenBank, as well as personal collection, in DNA Subway. Parasites are underlined.



(Figure 3.): The tree above highlights the similarities and differences between dulotic parasites and their hosts, and how dulotic relationships across genera seem to suggest a more distant relationship to their hosts. This was done through the use of the gene region CO1 as well as samples from both BOLD and GenBank. Parasites are underlined.

Results:



(Figure 2.): The alphanumeric labels refer to the GenBank accession numbers and the species assigned are associated with these numbers. The figure also shows the alignments between temporary parasites and their hosts, where the vertical bars align shows a genetic similarity between the species. The results were determined using the CO1 region in the mitochondrial DNA and comparing the samples, from BOLD, GenBank, as well as personal collection, in DNA Subway.

Discussion:

- Temporary parasites tend to be more closely related to their hosts than dulotic ants.
- Within the *Lasius* temporary parasites *Lasius aphidicola*, *Lasius minutus*, and *Lasius speculiventris*. These three are often confused with their European cousin *Lasius umbratus* both in taxonomic and DNA identification.
- Inquiline ants are theorized to be the most closely related to their hosts due to their behavior of infiltrating host colonies and climbing onto and living on the backs of host queens.
- Unsurprisingly dulotic ants generally are not closely related to their hosts. This would make sense since they enslave other species of ants through force rather than through pheromones.