An Investigation of Cryptic Species of Owl Butterflies at Long Island Aquarium Using DNA Barcoding

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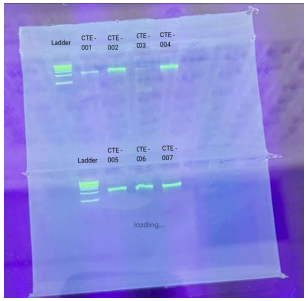

Abstract

Species of organisms have previously been defined by phenotype, but new technology and scientific methods allows scientists to genetically determine an organism's species. This has led to the discovery of cryptic species; species look similar but have a different genotype. I am looking to collect a cryptic species of butterfly, Brassolini, from Long Island Aquarium and see if some of the samples could've been labeled a different species than what they actually are. I am going to do this by using DNA barcoding to look at the CO1 gene of the butterflies to determine their species.

Introduction

A cryptic species is defined as a group of organisms that appear to be the same species but aren't (DNALC Exhibitions, 2015). Cryptic species happen when two or more species have a recent common ancestor (WildlifeSNPits, 2015). The idea of a cryptic species is relatively new, and some species of butterflies are found to be cryptic species. Before DNA barcoding, species were defined by their phenotype, or physical characteristics, causing cryptic species to grouped as one. Identifying these butterflies by DNA barcoding is much more effective because even though they look the same, the different species are genetically different.One type of cryptic species of butterfly is the owl butterfly. Owl butterflies are found in rainforests in central and south America. There are about 20 species of owl butterflies known for the eye spots on their wings (Wikipedia, 2023). For this project, I am looking to see if what subspecies the Long Island Aquarium thought they received is what they actually did get.

Materials & Methods

I collected my samples from the Long Island Aquarium. I then preserved our samples in ethanol until I were ready to extract my sample's DNA. I amplified the CO1 gene from my sample's DNA through Polymerase Chain Reaction (PCR). I then used gel electrophoresis to determine if my DNA extraction was successful. The DNA was then sequenced and I used DNA subway to identify the species of my samples.

Results

CTE-001 - *Caligo brasiliensis sulanus* Almond-Eyed Owl Butterfly, 2 mismatches
CTE-002 - *Attacus lorquinii* Pink Atlas Moth, 2 mismatches
CTE-003 - *Caligo atreus* Yellow-Edged Giant Owl Butterfly, 30 mismatches
CTE-004 - *Caligo brasiliensis sulanus* Almond-Eyed Owl Butterfly, 3 mismatches
CTE-005 - *Caligo brasiliensis sulanus* Almond-Eyed Owl Butterfly, 0 mismatches
CTE-006 - *Caligo eurilochus* Forest Giant Owl Butterfly, 2 mismatches
CTE-007 - *Caligo brasiliensis sulanus* Almond-Eyed Owl Butterfly, 0 mismatches

Discussion

All seven of my DNA samples were successful. Most were identified as an almond-eyed owl butterfly. The almond-eyed owl butterfly is a subspecies of owl butterfly that is found in various South American countries. My other samples were a pink atlas moth, a yellow-edged giant owl butterfly, and a forest giant owl butterfly. The pink atlas moth is a big moth found in forests in Asia. Adult pink atlas moths cannot eat because they have an only partially formed mouth so they rely on fat reserves from when they are larva and they don't live that long. Yellow-edged giant owl butterflies are a subspecies of owl butterflies found in Mexico and Peru. Yellow-edged giant owl butterflies feed on the juices of rotting fruit. The forest giant owl butterfly is a subspecies of owl butterfly found from Mexico all the way the the Amazon River basin in South America. They eat a number of host plants and fruits when they are larvae, and eat rotting fruit juices and nectar from various plants as adults.

At the Long Island Aquarium, these butterflies (and moth) were labeled as Caligo brasiliensis, or the almond-eyed owl butterfly. And while most of my samples were this subspecies, some of them were other subspecies of owl butterfly and one was a moth, even though all of my samples looked similar or the same. This illustrates the importance of DNA barcoding and genotyping. Since my samples were phenotyped, they were all grouped together as one subspecies when in reality they were three different subspecies of owl butterfly and a moth.

References

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