

Searching for Invasive Mosquito Species in Long Island

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Abstract:

As everyone knows, global warming has become a big issue in the current day and age. Due to both global temperature and carbon dioxide emissions steadily rising, mosquito migration patterns have continued to move north (Zika Virus, CDC, Figure 1), as the temperature has risen enough to fully support their development. Mosquito species, such as the *Aedes albopictus* (Rochlin 2013), otherwise known as the Asian Tiger Mosquito, are able to spread infectious diseases such as malaria and West Nile into the north (Kilpatrick 2006). As such, it is hypothesized that because of global warming, invasive species of mosquitoes are migrating to the Long Island area. The results of the experiment were inconclusive. Out of four mosquitoes collected, as only one sample was successfully amplified using PCR, and was able to be sequenced. Unfortunately, however, it was determined to be a member of the crane fly family using bioinformatics.

Introduction:

The purpose of this experiment is to find invasive mosquito species in order to test the biodiversity in the Centereach area. These researchers think that because of global warming, some species of mosquitoes may have migrated from other areas of the world to Long Island. The researchers will be examining different invasive species of mosquitoes migrating to the Long Island area from other regions. This group believes that climate change will allow species native to cooler zones to be able to migrate up to areas that would otherwise be too warm for the mosquitoes to survive in (Center for Disease Control and Prevention). Testing for the species, such as *Aedes albopictus* (Asian Tiger Mosquito), or *Aedes aegypti* (Yellow Fever Mosquito) (Rochlin 2013) could provide enough evidence to support these claims.

Materials and Methods:

For the actual extraction of the DNA of the collected samples, an attachment of the research group had to travel to Stony Brook University to process the samples. DNA was extracted and purified in accordance with the Barcode Long Island Protocol (CSHL DNALC 2014). At the laboratory, PCR was used to amplify the extracted DNA. Then, Gel electrophoresis was used to verify the amplification and the specimens that were amplified were sent out for sequencing. DNA Subway was used to analyze the sequences, and determine sequence similarity between BLAST hits and Reference Data.

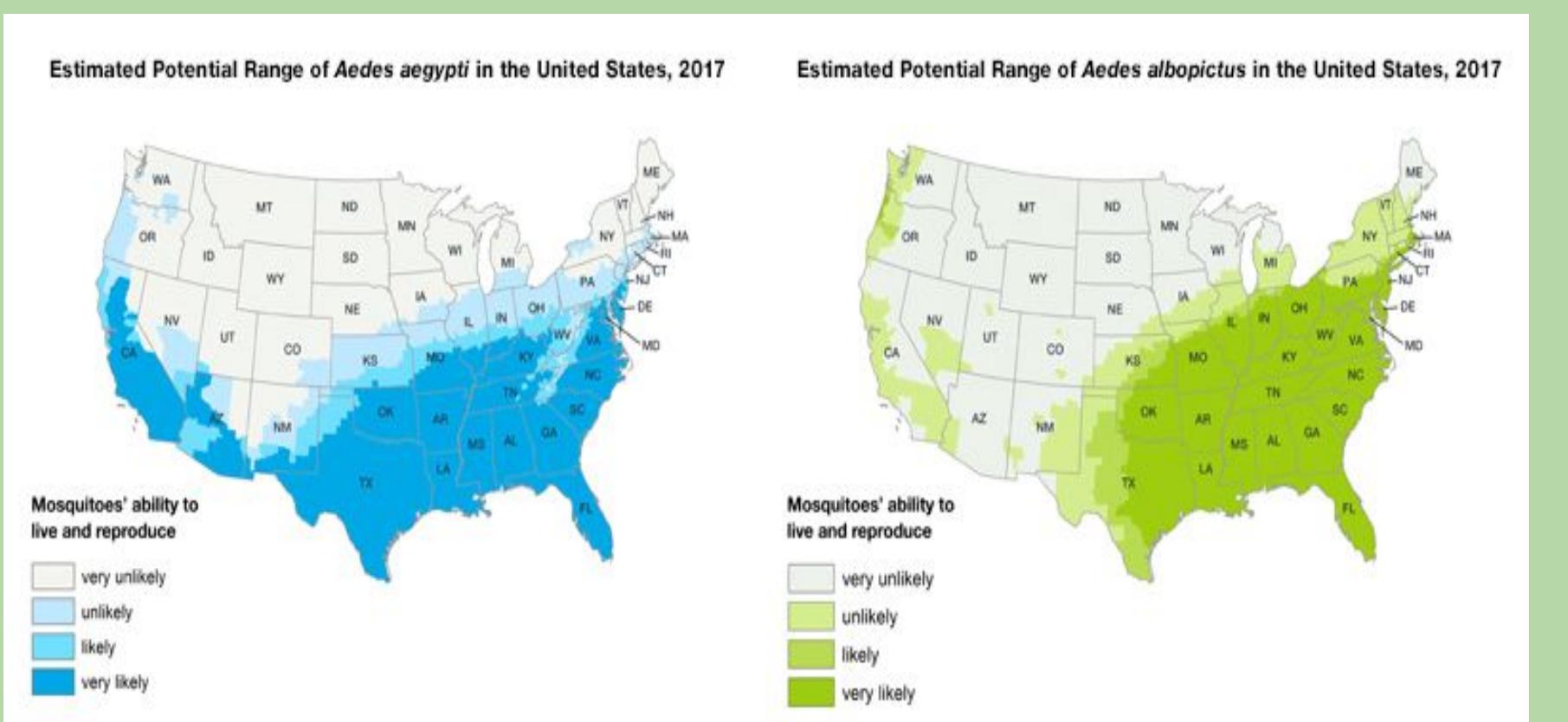


Figure 1. Estimated range of a mosquitoes' ability to live and reproduce. Center for Disease Control and Prevention 2017.

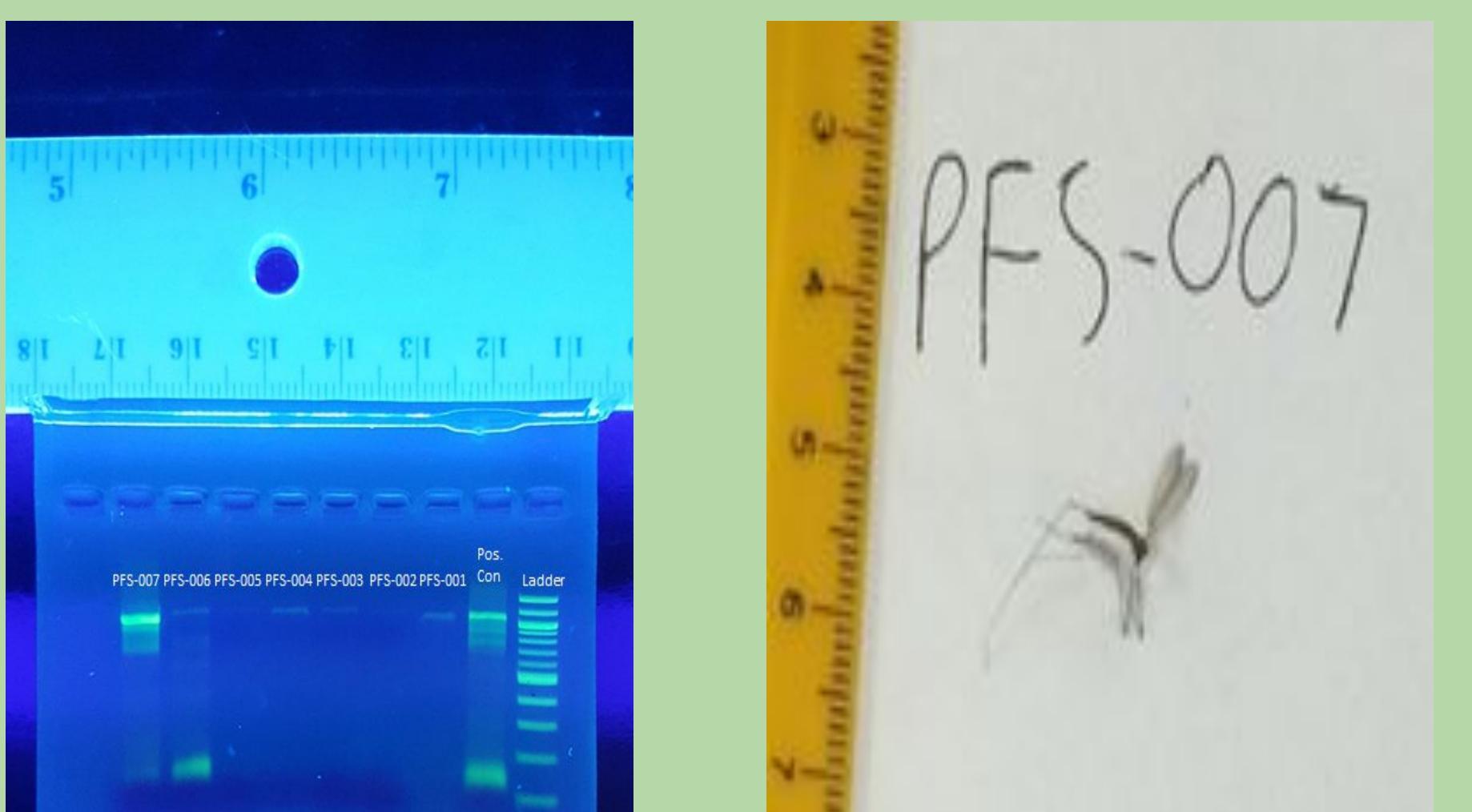


Figure 2. Gel Electrophoresis



Figure 3. PFS-007. Sample thought to be a mosquito, but sequenced as *Dicranomyia* sp.

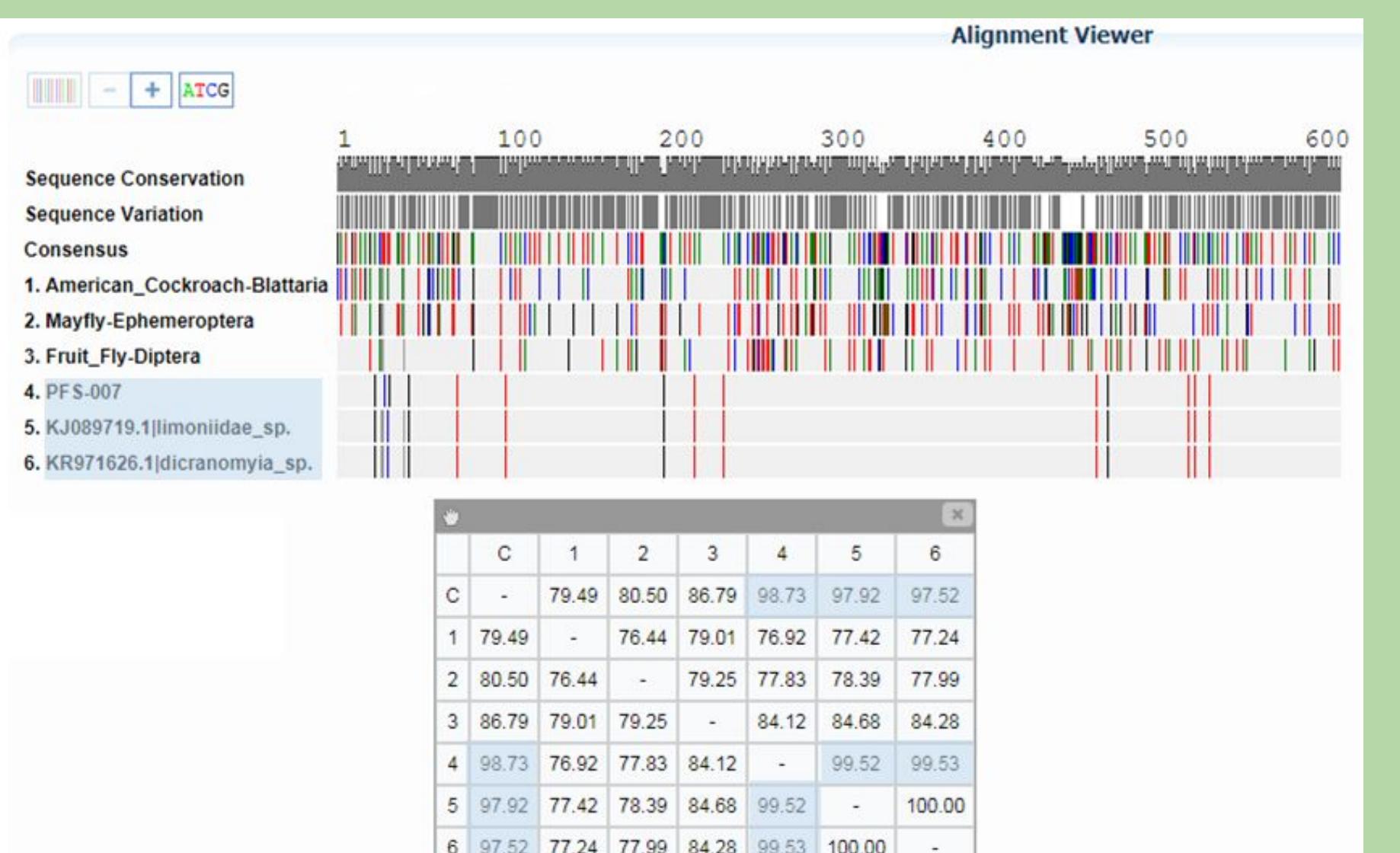


Figure 4. DNA Subway Bioinformatics. Alignment viewer shows similarity between PFS-007, *Limoniidae* sp. (99.52%), and *Dicranomyia* sp. (99.53%). Both are members of the crane fly family.

Conclusions:

Some of the DNA was not amplified at all. It is shown that PFS-007 was the only sample that's DNA was successfully amplified. There are several reasons as to why this could be. Some errors or inconsistencies might have occurred while doing the extraction. An example of this would be that some of the tissue sample might not have ground up thoroughly while in the lysis solution. Also, the silica pellet could have been affected somehow, like being punctured by the micropipette. Another notable variable would be the size of the sample and the amount of tissue obtained, as PFS-007 was in fact the largest specimen. A larger tissue sample would mean that there would be more DNA to be amplified by the polymerase chain reaction. However, with the discovery of PFS-007 not being a mosquito species after the DNA sequencing, the hypothesis of invasive species being present on Long Island because of global warming could not be proven correct nor false. This could affect future studies as not everything that looks like a mosquito can turn out to be a mosquito. Use of a field guide would be important, so as to compare the features of certain organisms when collecting samples. Also, the migration patterns of that particular crane fly could be used in support of global warming pushing different species upward to the north.

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