

The Effect of Human Impact on the Biodiversity of Spiders

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Abstract

Our research focused on testing to see if the biodiversity of spiders is affected by human impact. We hypothesized that the biodiversity of spiders would be affected by human impact. In order to test this hypothesis we safely contained spider samples from inside our houses (high human impact) and outside on our properties (lower human impact) in Rocky Point, New York. We used a taxonomic key to identify as many spider samples as we could. We photographed our spiders and used the DNA barcoding process to extract the CO1 gene of our spider samples and sent it to be analyzed. DNA Subway was used to determine the species of the spider samples. We found that the types of spiders found indoors were different species than those we found outdoors, suggesting that human impact has affected the distribution of spiders. There was no decrease in biodiversity observed in the indoor spiders.

Introduction

Spiders are one of the least researched organisms, with scientists thinking that over 60% of spiders are undiscovered (What is DNA Barcoding?). Spiders play an important role in ecosystems and they are found in most environments (Millennium Ecosystem Assessment, 2005). Different environments affect their size and body structure through gene expression, and spiders inherit different survival instincts depending on the environment (Glime, 2017). Spiders easily adapt to all kinds of environments including those with humans, opposed to many other organisms that fear and avoid humans (McLendon, 2015). The purpose of this study was to examine whether human impact affects the biodiversity of spiders. We hypothesized that human impact does affect the biodiversity of spiders.

Materials & Methods

Spider Collection

Over 20 spiders were collected in plastic containers inside and outside 2 homes in Rocky Point, NY during the fall of 2017. Specimens were first frozen and then stored in 95% alcohol. Spiders were photographed and identified using taxonomic keys. Average body lengths for indoor and outdoor spiders were calculated.

DNA Barcoding process

1. Isolate DNA from 20 collected samples
2. Amplify DNA by PCR
3. Analyze PCR products by gel electrophoresis
4. Send suitable DNA samples to be sequenced
5. Analyze results by comparing sample sequences to known sequences

Results

Visible bands appeared for 7 samples after gel electrophoresis. Sample PRW-0014 was discarded because of poor results on both the forward and reverse sequences. As seen in Table 1, 6 different genera are represented. 6 more spiders that yielded no DNA were identified using a taxonomic key, as seen in Table 2. Visual differences in color, size and build between indoor and outdoor spiders were observed as seen in Figure 1.

Tables & Figures

Table 1: Blast Spider Identification

Specimen number	Identification	Location
PRW-011	<i>Eustala anastera</i>	outdoor
PRW-012	<i>Hibana gracilis</i>	indoor
PRW-013	<i>Steatoda triangulosa</i>	indoor
PRW-015	<i>Parasteatoda tepidariorum</i>	indoor
PRW-016	<i>Eris militaris</i>	indoor
PRW-019	<i>Platycreptus undatus</i>	outdoor

Table 2: Additional Taxonomic Identifications

Specimen number	Identification	Location
PRW-001	<i>Dysdera crocata</i>	outdoor
PRW-002	<i>Metaltella simoni</i>	outdoor
PRW-003	<i>Phalangium opilio</i>	outdoor
PRW-005	Theridiidae	indoor
PRW-006	<i>Cheiracanthium</i>	indoor
PRW-007	Pholcidae	indoor

Fig 1:
Visual differences between outdoor vs. indoor spiders



Figure 1 compares the differences between indoor and outdoor spiders. We noticed that outdoor spiders tend to have a larger and more hardened build than the indoor spiders. Outdoor spiders tended to have larger fangs and heads as opposed to indoor spiders. The average body length for outdoor spiders was 6.7mm, and the indoor average size was 5.5mm.

Discussion

By the end of our experiment we have determined that our hypothesis was correct. Human impact does affect the biodiversity of spiders. The results support our hypothesis because there is no overlap between the two sets of spiders. There is no evidence that biodiversity is decreased by human impact, possibly due to the limited sample size. To fully assess the effect of humans on spiders, a much larger sample size would have to be identified. One difficulty we ran into during our study is that we were not able to get visible bands after electrophoresis from all spiders due to errors we made during the process. There was also a small sample size, and a lack of spiders from the forest area to show if limited human impact has an effect on biodiversity.

For future studies we are planning to collect more spider samples from both indoors and outdoors and also spiders from the forest. This will give us a larger sample size to work with and will provide a better assessment of the effect of human impact. The results of our experiment are very important because we live in a world that is very sensitive to human effects. We need to think about what kind of footprint we leave behind every day, and if the things we do can negatively affect the environment.

References

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