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# DISTRIBUTION OF WOOD EARS (*AURICULARIA AURICULA-JUDAE*) BASED ON SURROUNDING ENVIRONMENTAL FACTORS

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## ABSTRACT

Wood ears (*Auricularia auricula-judae)* are a wild mushroom, often enjoyed as a delicacy and also used for traditional medicinal practices. Because of their medicinal and nutritional benefits, these mushrooms are a popular and sought-after choice, but they can prove difficult to find. Because of this, we wanted to explore their abundance and various quantitative and qualitative factors that are commonly associated with them to hopefully make locating them easier and more frequent. Although there is already information on this topic, we wanted to extend it with other variables that are uncommon in existing material like soil moisture, distance from water, non-tree flora, etc. Based on already existing information, we hypothesize that we will find them near water and mostly on dead deciduous trees as they prefer these, specifically beeches (*genus Fagus),* spindles *(Euonymus europaeus),* and elders *(Sambucus nigra).* Our results found that higher temperatures were associated with fewer amounts and smaller sizes of wood ears (*Auricularia auricula-judae*), which makes sense as some literature indicates they prefer colder temperatures to hotter. Additionally, their size was also found to be significantly associated with proximity to water, growing larger as they grew closer to the water, proving their preference for damp environments.

*Keywords: beech trees* (Fagus sylvatica), *optimum range, physiological tolerance/stress, wood ears* (Auricularia auricula-judae)

## INTRODUCTION

The presence and abundance of many organisms, both plants and animals, are often impacted by their surrounding environment. Factors like vegetation, chemical variables, landscape, temperature, etc., can all influence what organisms persist in a certain habitat. Knowing what factors can influence certain species' success or failure can be very helpful for a range of environmental processes. For example, if a certain species is dying out and there are certain known factors that could stop or slow its decline, these could be implemented into the environment of the dying species to improve its population. Or, if there is an invasive species and we can pinpoint what factors it looks for that help its growth and success, we can look for other environments that may be targeted and work to prevent invasion before it becomes overwhelming and disastrous. Generally, having this kind of information for as many species as possible can help with sustainability and allow for more advanced knowledge and research. It also assists with locating and foraging for various plants, which can be a necessity for some and a hobby for others. Knowing a range of factors to look for besides just certain tree species can narrow down the search for hard-to-find flora.

In this study, we focused on wood ears *(Auricularia auricula-judae*) and various factors that we hypothesized would have some kind of impact or correlation to its abundance. These included the surrounding flora, soil and air temperature, distance from water, and amount of shade. Wood ears (*Auricularia auricula-judae*) are part of the jelly fungi species due to their rubbery

DOI

texture, and as their name suggests, they generally resemble the shape of an ear. They range in colors from tan to brown and sometimes pink, with silky and rubbery surfaces (see Figure 1 for appearance). They can grow alone or in colonies and their size ranges from 0.8 to 6 inches. We focused on one area to avoid any confounding variables such as anthropogenic disturbances, but in a large enough area to get varying data rather than mushrooms all extremely close to each other. Hopefully, by gathering enough data about their whereabouts and the surrounding conditions, we can make it easier to locate them for professional as well as personal reasons.

*Figure 1. The wood ear mushroom* (*Auricularia auricula-judae)*

## FIELD SITE

As wood ears (*Auricularia auricula-judae*) have certain surrounding factors that increase their abundance, we wanted to find a location that suits all of the environmental needs of the mushroom. For this study, we traveled to Trough Creek State Park, a protected area with a lazily flowing river and diverse spring flora. We intentionally chose to go after several days of rain, and the day we did go it was currently raining at that time as well. The area consisted of plenty of fiddlehead ferns (*Matteuccia struthiopteris*), may apples (*podophyllum peltatum*), maple trees (*Acer saccharum)*, beech trees (*Fagus sylvatica)*, laurels (*Kalmia latifolia)*, garlic mustard (*Alliaria petiolate)*, and skunk cabbage (*Symplocarpus foetidus)*. The ground was thoroughly soaked through, and the river had risen considerably after the rain. The spring fauna observed included many millipedes enjoying the wet woods, turtles (see Figure 2), orb weavers, and slugs. Wood ears prefer to grow on damp, decaying, deciduous branches and logs, and this environment after a storm was quite suitable. There were patches of coniferous trees, and as expected, none were found growing on that type of plant material, so the deciduous region of the forest was our main focus (see Figure 2). It is important to note that we chose to do our study in a single forest and environment, therefore the flora present for each specimen was largely the same.

*Figure 2. On the left is a photo of our field site and on the right is an example of fauna we found*

## METHODS AND MATERIALS

The materials we used included a handheld thermometer, a ruler, and a pen and paper for observational data. Only a few of our data points will be measured with instruments, while the rest are to be observational. Small containers were used for soil and mushroom samples, as well as a foraging knife to sustainably remove specimens from their growth site. Pulling the mushroom straight from the growth site can remove the mycelium underneath, possibly preventing it from fruiting further or completely removing the organism as a whole.

Upon finding a cluster of wood ear mushrooms, the number of specimens present and the length of the smallest and largest specimens in the cluster were taken. Afterward, the outside temperature was recorded. A general distance to the presence of a body of water was noted, as this impacts the moisture content in the soil and surrounding flora. Soil samples were then taken, and nearby flora and fauna were observed. As stated previously, wood ears do not grow on coniferous branches, so the presence of certain flora could impact their presence in the forest. The amount of shade in the area was noted to give us an idea as to whether full sun or shade impacts their growth. Lastly, the temperature of the soil was taken with a handheld thermometer.

## RESULTS

We collected our samples on May 4$^{th}$ and found 3 different clusters of wood ear mushrooms

(*Auricularia auriculajudae*). In these areas, we collected environmental data including distance from water, temperature, size, and count (Table 1). We then analyzed this data using a correlation matrix (see Figures 3 and 4).

*Table 1. Quantitative and qualitative data collected from the environment around our foraged wood ears (Auricularia auricula-judae*)

| Site | Date | Water Distance (ft | Temp (F) | Count | Shade | Largest (in) | Smallest (in) | Soil Temp(C) |
|---|---|---|---|---|---|---|---|---|
| 1 | 4-May | 20 | 66 | 3 | Partial | 1.2 | 0.6 | 18 |
| 2 | 4-May | 50 | 66 | 2 | Partial | 0.7 | 0.4 | 20 |
| 3 | 4-May | 100 | 65 | 44 | Partial | 1.25 | 0.1 | 18 |

Correlation Matrix

| | | Largest | Soil Temp | Smallest | Temp | Water Distance (ft) | Count |
|---|---|---|---|---|---|---|---|
| Largest | Pearson's r | — | | | | | |
| | df | — | | | | | |
| | p-value | — | | | | | |
| Soil Temp | Pearson's r | −0.997 | — | | | | |
| | df | 1 | — | | | | |
| | p-value | 0.052 | — | | | | |
| Smallest | Pearson's r | −0.196 | 0.115 | — | | | |
| | df | 1 | 1 | — | | | |
| | p-value | 0.874 | 0.927 | — | | | |
| Temp | Pearson's r | −0.569 | 0.500 | 0.918 | — | | |
| | df | 1 | 1 | 1 | — | | |
| | p-value | 0.614 | 0.667 | 0.260 | — | | |
| Water Distance (ft) | Pearson's r | 0.224 | −0.143 | −1.000 | −0.929 | — | |
| | df | 1 | 1 | 1 | 1 | — | |
| | p-value | 0.856 | 0.909 | 0.018 | 0.242 | — | |
| Count | Pearson's r | 0.587 | −0.518 | −0.909 | −1.000 | 0.921 | — |
| | df | 1 | 1 | 1 | 1 | 1 | — |
| | p-value | 0.601 | 0.653 | 0.273 | 0.013 | 0.255 | — |

*Figure 3. Correlation matrix showing results (statistically significant results marked by a star) between wood ear (Auricularia auricula-judae) abundances and environmental variables*

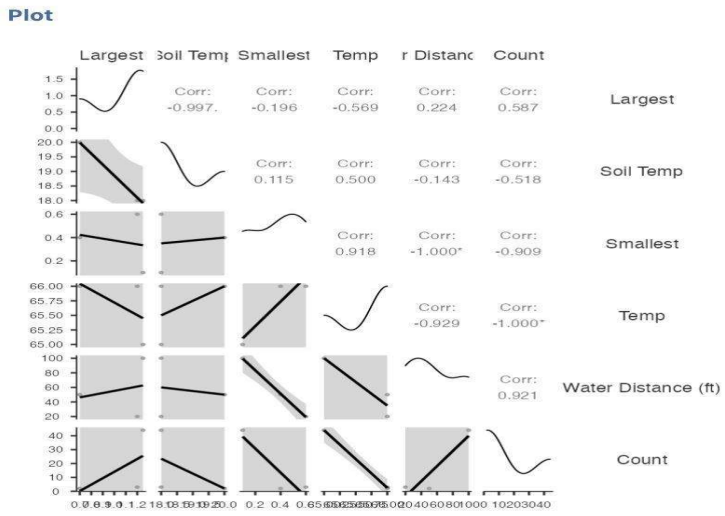


*Figure 5. Correlation matrix plots*

Although we were limited in the number of samples, a very low p-value indicates that the results are unlikely to have occurred by random chance, allowing us to make connections between the relationships between variables. From the results,

we can see a strong negative correlation between largest size and soil temperature (with a Pearson's r value of -0.997). This suggests that as soil temperature increases, the size will decrease significantly. The p-value for this correlation is around .05(.052), suggesting that this correlation may be significant. On the other hand, we saw the strongest negative correlation between the smallest size of mushroom and water distance (with a Pearson's r value of -1.0), indicating a perfect negative relationship. This suggests that as the distance from a water source increases, the size of the mushroom will decrease. The p-value for this test is very low (.018), indicating that this correlation is statistically significant. Additionally, we found a perfect negative relationship between temperature and the count of mushrooms found in a cluster with a significant p-value of 0.013. With this, as temperature increases, we would expect to find fewer mushrooms in a cluster. Overall, the results suggest that higher temperatures are associated with fewer mushrooms in a cluster as well as with a decrease in mushroom size.

## DISCUSSION

Our results show that *Auricularia auricula-judae* is most often found in areas with higher soil moisture, so they are more likely to be abundant closer to water. This partly validates our initial hypothesis that this species of fungus prefers damp environments near sources of water. Our results also show that the further the mushrooms were located from water, the smaller their size was: at 100 ft, the smallest mushroom we found was 0.1 in. in size, compared with 0.6 in. for one found significantly closer. Most of the individuals we found were on decaying beech wood. The wood ear mushroom (*Auricularia auricula-judae)* is a saprophytic fungus that feeds on dead organic matter such as trees like elder or beech. We can see from the results that when soil temperature is higher, fewer fungi are found. At 20 C°, we found just 2 individuals, compared with 44 at 18 C°. However, our study has some limits. Firstly, the data were all collected on the same day in an optimal climate (rainfall), which could have had an impact and therefore biased certain measurements such as soil moisture. In conclusion, this study suggests that wood ears (*Auricularia auricula-judae*) prefer moist, shady environments rich in dead wood, often close to a water source. These conditions can therefore be considered as ecological optimum. It is possible that these mushrooms have an aversion to conifers due to the production of tannins in their needles, which leech into the soil and can inhibit the growth of many plant species and are used as a deterrent for predators. The data that we collected validated our hypotheses on the environmental factors that impact *Auricularia auricula-judae* growth.

## ACKNOWLEDGEMENTS

We thank Dr. Glazier and the Juniata College ESS department, for providing the tools needed for measurements and their time and wisdom!

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