

Invertebrate biodiversity lab essay sample



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Introduction

Biodiversity is defined as the abundance and variety of organisms, genes and communities in nature. Pitfall traps were used to compare populations and communities of invertebrates in two different parts of the Nyabweya region, Uganda, with the hope of finding out whether human activities would decrease the biodiversity of an area and the number of invertebrates.

Aim

To investigate and to compare the biodiversity in two different areas in the southern part of Uganda. Area 1 is on higher ground, surrounding a chalet and is an area of high human impact, with mown grass, and cleared trees, thus there is less shade. Area 2 is a Eucalyptus plantation, which is about 200metres away from Area 1, with a significant amount of herbaceous undergrowth, mainly gramineae (bushes, grasses & shrubs). It is less influenced by human activity (such as settlement and agriculture) and the Eucalyptus trees are planted within a 2 to 3 metre range from each other. These invertebrates will be collected in pitfalls below the ground that are filled with olive oil and water. Two pitfalls in both areas are setup. The results are recorded twice a day for three consecutive days. This will help us to find out more about the diversity of bugs in these two areas and to draw conclusions from them.

Hypothesis and Prediction

Biodiversity of invertebrates is greater in more diverse and complex habitats, such as the Eucalyptus plantation, because there are more food resources

available and more plant species to support them in terms of shelter and protection. Typically, the greater the plant diversity of the habitat, the greater diversity of invertebrates. It would be expected that the pitfall close to the chalet would trap less invertebrates than the pitfall at the Eucalyptus plantation, due to negative human impacts which have destroyed many habitats of invertebrates. Most invertebrates in the area will be attracted to the smell of the olive oil, and when they eventually fall in they will not be able to escape due to the slippery environment resulting from the olive oil.

The oil will also suffocate them. If more invertebrates and a greater biodiversity are found in Area 2 then the conclusion can be based on the absence of human influences and also the greater availability of food and shelter, which has not been destroyed by human activities. Greater variety (biodiversity) and sizes of invertebrates will be found at Area 2 (little human interference), whereas at the area with greater human influence there should be smaller-sized and a smaller biodiversity of invertebrates. This is because, as explained above, the Eucalyptus plantation will provide more food and shelter to various invertebrates unlike Area 1 where the trees have been cleared and the grass cut, and habitats have been physically destroyed by humans for reasons such as agriculture, livestock rearing and settlement.

General Background

Invertebrates make up about 98% of all animal species, and they are a major component of biodiversity. They lack a vertebral column. These invertebrates are worms or insects. Air, earth, energy from the sun and all living organisms found on Earth depends on one another. Therefore abiotic

factors such as soil, temperature and water; as well as biotic factors- the types of trees and other living organisms found in an area will determine the number and the different types of invertebrate species that we will find in these two areas being investigated. Species diversity is the variety of species living in a particular habitat at a particular time. Many factors are now threatening the biodiversity of Southern Uganda due to human activities, as well as climate change, disease and pollution. Eucalyptus is an alien species that has been planted in Uganda for various reasons such as medicinal purposes. These trees have

Variables

Independent Variable

Two DIFFERENT areas are being investigated as described in the introduction.

Dependent Variable

This is the number of different species of invertebrates and their frequencies.

Controlled Variables

The sizes of the plastic cups, the depths at which these pitfalls are placed into the soil, the volumes of oil and water in each pitfall, and the same type of oil is used for each experiment.

Materials and Methods

List of All the Equipment

* 1 trowel

* Olive Oil

* Water

* 4 plastic cups: diameter 5cm, depth of 8cm

* 12 small rocks

* 4 large rocks

Diagram Showing the Setup of the Experiment

Method

Area 1:

1) Two areas were chosen where the biodiversity of invertebrates will be investigated; in this case it was the area near the chalet and part of the Eucalyptus plantation.

2) Randomly selected numbers from a calculator were generated and the location of the pitfall was chosen. If there was a feature nearby that would affect the results to a great extent such as a termite or ant hill, the pitfall locations were reselected to maintain accuracy.

3) The cup was filled with 3cm of water and 1 cm of olive oil. A bit of olive oil was spread onto the sides of the cups so that insects did not escape by crawling up the sides of the cup. Olive oil was used because it has a strong smell and will attract most bugs. A sweet substance such as honey was not

used because it will make the results inaccurate and attract more specific insects such as ants and bees, mostly.

4) The trowel and the ruler were used to dig an 8cm deep hole so that the cup could fit into the ground. The top of the cup was placed at ground level and not above ground level, as this would prevent any crawling insects from falling into the pitfall.

5) Once the cup was placed into the ground, all gaps surrounding the cup were filled with soil.

6) 3 small rocks were placed on the edges of the cup, as shown in the diagram.

7) One bigger stone was placed over the three small stones. This was done so that if it had rained, the cups would not be flooded; some insects like to go under rocks and stones and also to make sure that the insects can crawl under to rock and into the pitfall. It also prevented some invertebrates from flying out of the pitfalls.

8) The same method as described above was used for Area 2.

9) The pitfalls were left overnight and they were checked every morning at 7am and every evening at 6pm.

10) Once these pitfalls were checked, they were emptied and filled again with water and olive oil and the data (which is the number of invertebrate species and their frequency) was recorded into a table. If some of the

invertebrates were found alive then they were gently released back onto the ground.

11) A dichotomous key and an insect identification poster from the internet were used to identify the different species found in the pitfalls.

12) The same process was repeated for 3 consecutive days.

13) The total number and types of invertebrates found in the pitfalls in Area 1 and Area 2 were then compared.

How the Independent Variable Was Varied in the method:

Area 1 was NOT at the Eucalyptus plantation whereas Area 2 WAS at the Eucalyptus plantation. At both areas, randomly chosen numbers from a calculator determined the location of the pitfalls.

How Changes of the Dependent Variable Were Monitored

After checking each pitfall in the morning and evening and recording the results in a table, they were emptied and set up again.

How the Controlled Variables Were Controlled

A ruler was used to measure the depth at which these pitfalls would be submerged. And the same type of contents (oil and water), and their amounts were used so that insects would not escape from the cups, allowing only one variable to be measured.

How Collection Of Sufficient Relevant Data Was Recorded

Several trials were used, that is, over the course of three days. The data was collected by means of a table showing the data collected for each day.

Time of the year could have affected the number of invertebrates found in a certain habitat at a certain time. If it was a season where some invertebrates are not found easily, for example it is hard to find mosquitoes in cold weather; the results of the investigation would be inaccurate. Also, the existence of alien species such as the Eucalyptus trees in Area 2, could have affected the availability of adequate habitats for some invertebrates such as mosquitoes, as these trees contain some insect repelling chemicals. There is also a possibility of some invertebrates having escaped from the pitfall as they were falling in they could have flown out or they could have crawled out of the pitfall, and this could have in turn affected the results of the investigation. It is also possible that the pitfalls at Area 1 could have trapped invertebrates that did not necessarily inhabit that specific area; they could have just been passing, temporarily.

Conclusion

The results obtained in this experiment, as shown by the tables and the graphs, correspond to the hypothesis, as a greater biodiversity and number of invertebrates were found at Area 2, the Eucalyptus plantation, than Area 1 which was the area surrounding the chalet. The greater the amount of human impact the smaller the number of invertebrates and the smaller the variety of invertebrates will be found in an area. Less invertebrates were found near the chalet, due to clearing of trees and bushes, burning, mowing of lawn and ploughing of land for human-settlement and agricultural

purposes, which destroy many invertebrate habitats, such as various plants, trees and holes in the ground. Many invertebrates were probably killed in the process and parts of their food supply were reduced and destroyed.

Therefore, with limited availability of food, the population of insects and worms is reduced, and living species of invertebrates are less attracted to the area. However, there were a greater number of mosquitoes, German cockroaches and Odorous ants.

This is probably due to the presence of food, eaten by humans, in the chalet which attract these domestic pests. On the other hand, there was a greater biodiversity at the Eucalyptus plantation, as the area was in a more natural state, with greater amounts of plant species that provides nutrients, shelter and protection for a greater number and variety of invertebrates. The Driver Ants were the most common invertebrate found, and this is because this species travels in groups of up to 1000 and they can find their prey more easily, which is insect larvae and sometimes small rodents. Another factor is the sizes of both habitats. The Eucalyptus plantation covered a wider area as compared to the area surrounding the chalet, which was approximately an acre. The quality of the habitat at the Eucalyptus plantation is higher and thus it can support a wider range and number of species.

Evaluation

Evaluation of the Method Used:

The method has proven to be quite a successful one. Considering the small volume of the plastic cup, a significant amount and variety of invertebrates were trapped, which was enough to calculate a relatively accurate and

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representative biodiversity index for both areas. Perhaps a greater sample of invertebrates could have been collected, by use of a larger cup or tin.

Main Weaknesses in the Method

This was concerning the ethical issues involved in the investigation:

- * Every species has the RIGHT TO LIFE whether useful to the human race or not.
- * Each area's wild-life is of cultural importance to the local human population and it is WRONG to destroy it (even though some locals might be destroying it themselves).

Therefore this experiment was not entirely ethical as some bugs were killed in the process.

- * The method of using pitfalls to investigate biodiversity is not entirely representative of the whole community, and it could be solely based on chance.
- * Some invertebrates are inactive and do not move around much, and so the pitfalls only trap those species that move around a lot such as the ants.

Suggested Improvements that can be Investigated

- * A greater number of pitfalls could have been setup in each area to generate a more accurate result.
- * A grid pattern when laying pitfalls could be used, after having selected the location randomly, so that a greater depth of knowledge and understanding

could be achieved in terms of different species found in relation to the other species found in surrounding pitfalls as well as the location in relation to the distances of the pitfall locations from edges of plantations and buildings. This would also be important in determining.

* An alternative method for collecting invertebrates without having to kill them should be considered due to the ethical reasons mentioned previously.

New Questions that Could be Posed

* Further investigations could be done to determine whether the plant species richness affects the number of invertebrates found in an area.

* If some human activities could be promoting biodiversity, such as the existence of artificially fertilized areas.

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