Different Microorganisms in a Drop of Creek

Water Taken from Varying Depths

Photo of diatoms, phylum Chrysophyta; algal protists. (Parks; Encarta)

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Biology 2\*

May 12, 1997

#### Introduction:

Microorganisms include a vast number of protists, members of the kingdom Protista. Protists are eukaryotic, may be unicellular, colonial, or multicellular, and can reproduce asexually or sexually. They may be scavengers, like amoeba, filter feeders, carnivores, or have parasitic forms. Protists consist of algal protists, protozoa, and fungal protists. Algal protists, the plant-like protists, are important components of plankton and are the major producers in most aquatic habitats. They include green algae, which are believed to be related to green plants, golden algae, part of the phylum Chrysophyta, blue-green algae, and brown and red algae, which can be eaten and used for products. Chlorophyta, Euglenophyta, Chrysophyta, Rodophyta, and Phaeophyta are several phyla of the algal protists. Protists in the phylum Chlorophyta may have flagella. Those in Euglenophyta are multicellular, and some may eat things. In Rodophyta, protists are only multicellular and in the ocean. Red algae, included in this phylum, can grow at very great depths, up to 80 feet below the surface, because they are able to absorb blue/violet wavelengths. Brown algae are included in Phaeophyta; they live in the ocean and are also multicellular. Diatoms are the most important organisms in the phylum Chrysophyta. They have a two-part shell made of silica and produce over half of the world's oxygen. Dinoflagellates, another type of organism in the phylum Pyrrophyta, produce toxins, which contaminate and harm other organisms that eat them. Our project dwells mainly on protozoa. Protozoa are unicellular, though some may form colonies, and heterotrophic organisms. They are animal-like; they move and eat and are classified according to how they move. There are sarcodines, which form pseudopods, ciliates, which have cilia and move quickly, sporozoa, which have no self-movement but release spores and are parasites of animals, and animal-like flagellates, which have up to four flagella that beat back and forth. Another method of movement is by amoeboid motion. Flagellates are the primary component of the marine food chain. Different flagellates show plant, algal, and fungal features. Some familiar forms of protozoa are paramecium and amoeba. Amoeba are in the phylum Sarcodina and are, on average, about 0.025 mm in length. They not only live on aquatic plants but also in moist soil or as parasites in animals. These protists form pseudopods. Paramecia are unicellular organisms that move by the means of cilia and feed on bacteria. They are mostly found in freshwater, but there is one marine species. Protozoa range in size from 2 to 70 micrometers. They generally eat bacteria, waste products of other organisms, algae, or other protozoa. Over 20,000 species of protozoa are known.

Photo of a paramecium, phylum Ciliophora. (Walker; Encarta '95)

Photo of blue-green algae. (Parks; Encarta '95)

Photo of a dinoflagellate, phylum Pyrrophyta. (Grave; Encarta)

Photo of an amoeba, phylum Sarcodina, engulfing a paramecium. (Parks; Encarta)

#### Question:

How does the distribution of microorganisms differ in different depths of water at the Arroyo Del Valle?

#### Hypothesis:

If the experimental area of water in the Arroyo Del Valle creek is deep, then it is more likely that there will be a different variety and greater abundance of microorganisms than in shallow water.

#### Materials:

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| --- | --- |
| compound light microscope | dropper |
| 6 slides and cover slips | yardstick |
| stick | dye (for coloring slides), such as Crystal Violet |
| sample tray, with at least 12 wells | small jar (with lid) |
| long gloves | long tongs |
| resources (for identifying organisms) | apron and goggles (if use dyes) |

#### Procedure:

1. Research on freshwater microorganisms and protists, especially protozoa, to know the background of the project before beginning.

2. Select six specific locations of varying depths at the Arroyo Del Valle creek. To find the depth of the water, put a stick upright in the water and measure the length that is wet with a yardstick.

3. Record the depths of water, locations of the sites, and description of sites (for further explanation of the different organisms).

Our record of sites:

|  |  |  |  |
| --- | --- | --- | --- |
| Site Number | Depth of Water | Location of Site | Description of Site |
| Site 1 | 2 inches | under the bridge shore | - most times shady |
| Site 2 | 10 inches | opposite the island | - very sunny; no shade |
| Site 3 | 29 inches | big trees near the train tressel | - at times shady, sunny |
| Site 4 | 21 inches | hole between the trees near the tressel | - mostly shady |
| Site 5 | 8 inches | pool before site #2 | - sunny, shady, few trees |
| Site 6 | 5 inches | houses begin | - mostly shady |

4. Take several small samples of the water at each site and put each sample in a different well in the sample tray.

5. In order to ensure that the water collected is from the desired depth, wear short sleeves and long gloves. Keep the lid on the jar until you reach the bottom of the creek. Then open the lid for a few seconds and close it before bringing the jar back up. For very high depths (i.e. 29 inches), bring two long tongs to clasp the lid and jar when you lower them into the water.

6. On the same day, put a drop of water from each site on six different slides to put underneath the microscope.

7. Look through the microscope. Use the resources to identify the microorganisms. If needed, use dyes to see the organisms more clearly. You should wear goggles and an apron when you use dyes because they may stain clothes. If there is any trouble identifying the specific organisms (the pictures may look similar or unclear), choose the organisms that most resemble the ones on the slides.

8. Record each microorganism and its quantity under the slides, separating the organisms of each site.

9. Dispose of the water on the slides and repeat procedures 5 -8 two more times, each time using different water for the slides. This is to obtain as much data as possible on the different types of organisms at that particular site. However, there is no way to identify every single organism; the area is too large.

10. Clean up work area and put away microscope, slides, and other materials used.

11. Compare the microorganisms of each site. (Draw pictures of the organisms to compare similarity.)

12. See if the results support or disprove the hypothesis.

#### Data/ Results:

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| --- | --- | --- | --- |
| Site Number | Depth of Water | Microorganisms Found | Quantity |
| 1 | 2 inches | Nitzschia  Striamoeba | 6  42 |
| 2 | 10 inches | Campylodiscus  Navicula  Discamoeba | 5  7  2 |
| 3 | 29 inches | Navicula  Mesotaenium  Achnanthes | 9  12  5 |
| 4 | 21 inches | Stephanodiscus  Navicula  Cosmarium | 39  4  9 |
| 5 | 8 inches | Frustulia  Stephanodiscus  Melosira | 2  1  6 |
| 6 | 5 inches | Cyclotella  Nitzschia | 1  3 |

The shallowest part of the water, Site #1, was only 2 inches deep. We found a total of only two different microorganisms, although they had a variety of sizes. The Striamoeba were plentiful; we observed 42 of them. The other organism, Nitzschia, was less abundant, and we only found six. The total number of organisms we found in the water we sampled here was 48.

On the other hand, the deepest part of the water, Site #3, was 29 inches deep. We expected to find many more different microorganisms in much greater numbers than at Site #1. However, we found only three different microorganisms, Navicula, Mesotaenium, and Achnanthes. There were nine Navicula, twelve Mesotaenium, and five Achnanthes. This came to a total of only 27 organisms for the amount of water we tested, a number much lower than at Site #1.

We wanted to know what caused the results to turn out differently from our hypothesis. It could have been error. We also didn't know why we didn't see much variety of organisms, even in the deeper sites.

#### Conclusion/Analysis:

If the experimental area of water in the Arroyo Del Valle creek is deep, then it is more likely that there will be a different variety and greater abundance of microorganisms than in shallow water.

Our data partially disproves the hypothesis. The results could be inaccurate because of human error. First of all, we could only collect a small amount of water from each site; this may have made the variety of microorganisms significantly less. Secondly, some microorganisms are too small to see through a light microscope at only 400x, and we did not have access to a more powerful microscope. In addition, since many of the organisms we saw were moving, we may have miscounted them; consequently, the abundance we saw may be inaccurate. Although we identified every organism we saw and tried to identify them accurately, many organisms with different names looked similar. We had to choose the one that most closely resembled the organism under the microscope. The amount of sunlight at each site differed as well, which could have been a factor in the results. Some organisms prefer different amounts of sunlight, and they might not be present in an area that does not suit their preferences. This could cause a difference in abundance and variety.

At some sites, our hypothesis was supported. For instance, site #3 had a total of 27 organisms, and it was at 29 inches deep. Site #6 was 5 inches deep, and we found only four organisms. This supported our hypothesis that at greater depths, there would be more variety and abundance of microorganisms.

Overall, there were differences of microorganisms at each site. Some sites with close depths had a few similar organisms, like in sites #3 and #4. They were 29 and 21 inches, respectively. We found the organism Navicula at both sites. We conclude that this is because the organism prefers a depth around 25 inches deep. The two sites also had moderately similar amounts of sunlight reaching them.

There is a large possibility of human error in that the most variety of organisms we found at a site was three microorganisms. We think there were actually more that we either did not see or did not collect enough samples of the water to have them in our sample tray.

We observed that the organism Stephanodiscus was found at sites #4 and #5, which had a great difference of depths. Site #4 was 21 inches, and site #5 was 8 inches deep. At site #4, we found a large number of the organism, in total 39 of them. At site #5, we only found one of them. This most likely meant that usually the organism preferred staying in deep water. A variation of the organism lived in shallower water; it was able to survive and adapt well to the difference in depth of water. As a result, we only found one organism at the shallower site.

It was surprising to find so many of one organism at site #1, which had 42 Striamoeba organisms and a few Nitzschia. Site #2, at 10 inches, had three organisms (Campylodiscus, Navicula, and Discamoeba) but not many of each one.

This creek project was a good learning experience because we did learn how to carry out experiments and do a survey. Although there was error, we found out that at different depths there are different varieties of organisms. Further experiments should fix our errors to get more accurate results; it would be helpful to know how to be sure you have identified all the organisms that are present.

#### Future Research/Experimentation:

Our results could be inaccurate because of human error. The variety of microorganisms may have become significantly less because we could only collect a small amount of water from each site. We might have been unable to see some of the smaller microorganisms; the microscope we used only magnified 400x. Another factor that changed the results was miscounting. Many of the organisms we saw were moving; consequently, the abundance we saw may be inaccurate. We identified every organism we saw and tried to identify them accurately, but many organisms with different names looked similar. The one that most closely resembled the organism under the microscope may have been a different one.

For future research and/or experimentation, collect large samples of water from each site. If possible, use a more powerful microscope to try to see more microorganisms. Have four to five people looking at the same site and counting to get a more accurate number for abundance. Keep tally and count several times to make sure. Be sure to look at the organisms on the same day they are collected. Get more detailed resource books for identifying organisms.

#### Acknowledgements:

We would like to thank Mr. Thiel for letting us borrow his microscope, sample tray, slides, and other important materials that we needed for our creek project. We also thank him for letting us use his resource books on protozoa and fresh-water biology, giving us advice along the way, and helping us build our Web page.

Thanks also to Truc's parents for letting Truc use the computer in their office to get on the Internet for research.

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