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Truc Nguyen<P>

Amber Hayslett<P>

Biology 2o<P>

May 12, 1997<P>

<center>Different Microorganisms in a Drop of Creek<br>

Water Taken from Varying Depths<br></center>

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<P>Introduction:<P>

<line=justify> 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.<P>

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

<center><img src ="param.gif"></center><p>

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Left: photo of blue-green algae. (Parks; Encarta '95) Right:

photo of a dinoflagellate, phylum Pyr- rophyta. (Grave; Encarta)

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Photo of an amoeba, phylum Sarcodina, engulfing a paramecium.

(Parks; Encarta)

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

Encarta)

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<P>Question:<P>

How does the distribution of microorganisms differ in different

depths of water at the Arroyo Del Valle?<P>

Hypothesis:<P>

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.<P>

Materials:<P>

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)

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Procedure:<P>

1. Research on freshwater microorganisms and protists,

especially protozoa, to know the back- ground of the project

before beginning.<P>

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.<P>

3. Record the depths of water, locations of the sites, and

description of sites (for further explan- ation of the

different organisms).<P>

Our record of sites:<P>

Site Number Depth of water Location of Site Description of

Site

Site 1 Site 2 Site 3 Site 4 Site 5 Site 6 2 inches 10 inches 29

inches 21 inches 8 inches 5 inches under the bridge shore

opposite the island big trees near the train tressel hole

between the trees near tressel pool before site #2 houses begin

- most times shady - very sunny; no shade - at times shady,

sunny - mostly shady - sunny, shady, few trees - mostly shady

<P>

4. Take several small samples of the water at each site and put

each sample in a different well in the sample tray.<P>

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 wat- er.<P>

5. On the same day, put a drop of water from each site on six

different slides to put underneath the microscope.<P>

6. 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 organ- isms (the pictures may

look similar or unclear), choose the organisms that most resemble

the ones on the slides.<P>

7. Record each microorganism and its quantity under the slides,

separating the organisms of each site.<P>

8. Dispose of the water on the slides and repeat procedures 5 -8

two more times, each time us- ing 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.<P>

9. Clean up work area and put away microscope, slides, and other

materials used.<P>

10. Compare the microorganisms of each site. (Draw pictures of

the organisms to compare simil- arity.)<P>

11. See if the results support or disprove the

hypothesis.<P>Data/ Results:<P>

<center><table border=4><tr><td>Site Number</td><td>Depth of

Water</td><td>Microorganisms

Found</td><td>Quantity</td></tr><tr><td>1</td><td>2

inches</td><td>Nitzschia<br>Striamoeba</td><td>6<br>42</td></tr><

tr><td>2</td><td>10

inches</td><td>Campylodiscus<br>Navicula<br>Discamoeba<br></td><t

d>5<br>7<br>2</td></tr><tr><td>3</td><td>29

inches</td><td>Navicula<br>Mesotaenium<br>Achnanthes</td><td>9<br

>12<br>5</td></tr><tr><td>4</td><td>21

inches</td><td>Stephanodiscus<br>Navicula<br>Cosmarium</td><td>39

<br>4<br>9</td></tr><tr><td>5</td><td>8

inches</td><td>Frustulia<br>Stephanodiscus<br>Melosira</td><td>2<

br>1<br>6</td></table></center>

Site Number Depth of Water Microorganisms Found Quantity

<P>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

<P>

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.<P>

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.<P>

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.<P><P>Conclusion/Analysis:<P>

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.<P>

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.<P>

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.<P>

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.<P>

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.<P>

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.<P>

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.<P>

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.<P>Future Research/Experimentation:<P>

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.<P>

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.<P>

Acknowledgements:<P>

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.<P>

Thanks also to Truc's parents for letting Truc use the computer

in their office to get on the Internet for research.<P>

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