Diversity of Puget Sound III: Microscopic diversity

READING
Chapter 28; p. 654

OBJECTIVES
This lab has three main objectives:
• To allow you to observe, identify, and document the wide variety of microscopic organisms that live in the marine and freshwater habitats of the Puget Sound region.
• To familiarize you with some of the basic structural features of some representative protists and planktonic organisms.
• To give you more practice writing lab reports and constructing tables.

There is an incredible diversity of organisms at the microscopic level, and we will only be able to take a general overview of this diversity during our three-hour lab period. We will see many members of the polyphyletic group formerly known as the Kingdom Protista, as well as some small multicellular organisms from the other three Kingdoms. Of course, all multicellular organisms start out as a single cell and then grow over time, so we may see the larval stages of some organisms in our plankton samples from different habitats.

LAB PREPARATION QUESTIONS: Due at the start of lab. (2 pts; 10% of lab grade)
Please answer the following questions on a separate sheet of paper. Answers must be typed. These questions are designed to train you for the mystery to be solved in the lab. Make sure you cite the sources that you used for each answer. Your book will probably suffice although it is highly unlikely that it will have the exact answer to each question; you’ll need to extrapolate from the information given. In this way, we hope that you will develop a “feel” for the different organisms before you come to lab.

1. In your own words, what is plankton and what is the basic difference between phytoplankton and zooplankton?
2. When looking at a sample of pond water with a microscope, you see a GREEN single-celled organism moving around. Is this organism most likely an autotroph or heterotroph? Briefly explain how you came to this conclusion.
3. What is a key feature of Diatoms that you can see with a microscope? This feature should enable you to distinguish diatoms from all other protists.
4. What are phyla within the polyphyletic group formerly known as the Kingdom Protista that contain LARGE multicellular organisms?
5. How would you recognize a Ciliate (member of the clade Ciliophora) in a sample of water under a microscope? Are ciliates autotrophs or heterotrophs?
6. What are pseudopodia and which groups possess them? For what are pseudopodia used?
7. In addition to size, what are some visible features that would help you to distinguish between multicellular and unicellular microscopic organisms?
THE BIG MYSTERY

In the lab you will be provided with four different plankton samples collected from four MYSTERY habitats. Your job is to determine which sample is from which habitat. To do this, follow the following procedure:

- Carefully and thoroughly examine each sample. You may want to use both dissecting and compound scopes depending on the sample.
- Use the books provided in the lab to identify the major groups of organisms present in the sample.
- Once you have identified the major group to which a particular specimen belongs, try to identify other members of that group. Again, there will be handouts in the lab to help with this.
- Fill out a Data Summary Table for each sample. In these tables, you will record what groups were present in a particular sample, how many different members of this group were present, and the relative abundance of the different groups.
- Based on the contents of each sample, hypothesize which sample is from which habitat.

IMPORTANT: When identifying the organisms, please keep the overall goal in mind ➔ You are trying to determine which sample is from which habitat. Thus, don’t worry about classifying each organism you see to the genus level. It’s the BIG PICTURE of the inhabitants that is important.

Viewing tips: To view the organisms, start by taking a small sample of your water, muck, or decaying organic matter and put it in a bowl. Then examine it under a dissecting microscope to see if there are any large unicellular organisms present. If you find some, transfer them with a pipette to a slide and examine them under higher magnification. To do this, place 1-2 drops of sample on a slide and cover with a cover-slip. Hint: you can easily fit two of these preparations on a single slide. Some samples might contain scum or muck. Examine the muck and scum as well as the water; some of the most beautiful organisms live in the grossest environments (for example, in large high-rises). Cruise around the slide on low power and look for things that have a "shape" and/or that move. When you find one, go to a higher power for closer observation.

NOBODY SHOULD BE IDLE: Each person in the group can examine a sample of your collection. Remember that there are only 2 drops of your huge sample under each cover-slip; to get an accurate idea of what is in a habitat you will want to examine as many 2-drop samples as possible from a given collection. PATIENCE IS VERY IMPORTANT; don’t give up if you don’t find signs of life on your first or second try.
DUE FOR NEXT WEEK: A ONE-PAGE SCIENTIFIC PAPER (18 pts; 90% of lab grade)

Each paper should have the following parts. Each part carries specific point values in your final grade:

**Introduction (about 3 sentences):**
- A short description of what the main objective of your study was. Since this investigation is not hypothesis driven so you won’t have a specific hypothesis.

**Material & Methods (about 3 sentences):**
- A concise description of how you performed your investigation.

**Results (3-4 sentences):**
- Text: A verbal description of your results so that a reader could envision your results without looking at the table.
- Table: A clear table that summarizes your results. It should be a compilation of the main results from your organism data tables. Review pages 34 – 35, and 115 – 117 in your writing handbook for how to organize and create tables. An example of one way to organize a summary table is shown below.
- Tables must be computer generated. Instructions for constructing tables in MS Word are in your writing handbook on pp. 115 - 117. If you need additional help, please see me, your TA, or a table-savvy friend.
- Don’t forget to refer to the table parenthetically in the results text so that your reader knows where to look for the evidence.
- LOOK ==> Tables must be on a separate page at the end of the paper.

**Discussion (remainder of the paper):**
- In this section you should discuss the rationale for your conclusions. For example, clearly explain WHY you believe Sample 4 is a marine sample. What were the key features of this sample that led to your conclusions?

**Appendix:**
- This section should contain your raw data (= the summary tables that you filled out in lab cataloging the organisms present in each sample). Messy is fine ... in fact, we like messy!

Example Table*:

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Ciliates</th>
<th>Euglenoids</th>
<th>Small adult crustaceans</th>
<th>Larval crustaceans</th>
<th>Diatoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>++</td>
<td>++++</td>
<td>-</td>
<td>-</td>
<td>++</td>
</tr>
<tr>
<td>2</td>
<td>++++</td>
<td>+</td>
<td>++++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>++++</td>
<td>-</td>
<td>-</td>
<td>++++</td>
<td>++++</td>
</tr>
<tr>
<td>4</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

* The organism groups are just examples. Thus, if you use this model you will need determine what groups to use.

Reminders:
- Review pages 17 – 20 and chapter 4 in your writing handbook to refresh your memories about the content, style and tone of scientific papers.
- Material and Methods sections should be in paragraph form (no lists!) and should be written in the past tense.
- Use the past tense whenever you write about your results. This rule applies to both the Results and Discussion sections.
- Use a combination of active and passive voice to keep the writing interesting.
Your One Page Scientific Papers will be evaluated according to the following criteria:

Format & Presentation (40%)
• One page single-spaced –or- two page double-spaced, typed 12-point font with 1 inch margins
• Table on separate pages at the end of the paper with informative title
• Is correct grammar used throughout?
• Is the organization optimal and logical?
• Is the paper free of typographical errors & misspellings?
• Stapled!

Content (60%)
• Does each section contain the information specified in the instructions?
• Does the results text adequately describe the results so that a reader doesn’t have to look at the table to envision the results?
• Does the table clearly show the major trends or does a reader have to work at figuring out what the author is trying to show?
• Does the table have an informative title positioned in the proper place?
• Does the discussion section clearly explain the rationale for your conclusions about what sample is what?
WHAT IS THE BIG PICTURE OF THIS LAB?
• Figuring out exactly what every organism you find is? NO!
• Figuring out where each sample is from based on the overall diversity it contains? YES!

SAMPLE 1

<table>
<thead>
<tr>
<th>Name of Group (e.g. cyanobacteria, green algae, protozoa, diatoms, multicellular animals, etc.)</th>
<th>Number of Different Species Observed</th>
<th>Relative Abundance of Group in this Sample (use +, ++, ++++, as relative ranks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional notes:

SAMPLE 2

<table>
<thead>
<tr>
<th>Name of Group (e.g. cyanobacteria, green algae, protozoa, diatoms, multicellular animals, etc.)</th>
<th>Number of Different Species Observed</th>
<th>Relative Abundance of Group in this Sample (use +, ++, ++++, as relative ranks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional notes:
WHAT IS THE BIG PICTURE OF THIS LAB?
- Figuring out exactly what every organism you find is? NO!
- Figuring out where each sample is from based on the overall diversity it contains? YES!

**SAMPLE 3**

<table>
<thead>
<tr>
<th>Name of Group (e.g. cyanobacteria, green algae, protozoa, diatoms, multicellular animals, etc.)</th>
<th>Number of Different Species Observed</th>
<th>Relative Abundance of Group in this Sample (use +, ++, ++++, ++++, as relative ranks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional notes:

**SAMPLE 4**

<table>
<thead>
<tr>
<th>Name of Group (e.g. cyanobacteria, green algae, protozoa, diatoms, multicellular animals, etc.)</th>
<th>Number of Different Species Observed</th>
<th>Relative Abundance of Group in this Sample (use +, ++, ++++, ++++, as relative ranks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional notes: