

# **Fish 270: Aquatic Ecophysiology**

## **Winter 2024**

### **Writing Scientific Papers**

As a group, you are responsible for writing formal scientific reports for each lab challenge. Below, we have outlined what your paper should look like and included some tips on how to write a good lab report.

The general format for a scientific paper is as follows:

Title  
Introduction  
Methods  
Results  
Discussion  
Tables and Figures

#### **Title**

Titles should...

- Describe the content of your project
- Be precise and not too wordy
- Be interesting – you need to “hook” your audience into reading your paper!
- Provide key words that will make it easier to find

Titles should not...

- Be pretentious
- Include superfluous words such as “studies of” or “an investigation of”
- Use abbreviations or jargon
- Use “cute” or “folksy” language – keep it formal!

#### **Introduction**

Introductions should answer the following questions:

- 1) What is the problem?
  - Describe what research question(s) you investigated
  - Explain how your study fits into the broader scientific field
- 2) Why is your study important?
  - What rationale can you provide for performing the study?
- 3) How do you propose to address this problem?
  - Briefly describe what you set out to do in your experiment (goals/objectives)
  - What is your general experimental design or method(s)?

- State your hypotheses

Other tips:

- Format should follow an inverted triangle, moving from general/broad at the start to more specific at the end (e.g. broader problem in the real world/scientific literature → your specific experiment)

## Methods

Methods should describe your procedure(s) in enough detail that another person could replicate your experiment. This section should be clearly written, and include details such as:

- Your sampling method (e.g. random sampling, sorted into groups by a certain characteristic, systematic sampling, etc.)
- Information about your study site (if relevant)
- Materials and instruments used throughout the experiment
- The steps you took in conducting your experiment
- Any statistical methods used to analyze your data

Other tips:

- Use past tense to describe your procedure
- Try not to use passive voice (eg. Say “we analyzed the data...” not “the data were analyzed”)
- Quantify when possible (e.g. use “we added 10 mL of 30 ppt saltwater to a beaker with 200 mL fresh water” instead of “we added just a little bit of salt water to some fresh water”)
- Use metric for all measurements! Military time should be used for all time measurements (e.g. use “At 1500 we observed...” instead of “At 3 pm we observed...”), temperatures should be in degrees Celsius, distance/length in centimeters, meters, or kilometers
- DO NOT report any results in your methods section

## Results

This section should be an objective report of the outcomes of your study. Summarize the data and include the results of any statistical analyses you have done. In addition to this text, use figures, tables and equations to present your results concisely. Figures include maps, pictures, and graphs. All graphs should be created on a computer either with Excel or R (or any other programming language are you familiar with).

Tips on tables and figures:

- All figures and tables should be numbered in the order they are discussed in the paper
- Table captions should be listed *over* the table and should explain the data being shown
- Figure captions for figures go *below* the figures

- All figures and tables should be listed in a separate section following the Discussion section

Do not include any interpretation of your results – save this for the Discussion section. However, give a brief description of the key findings and make sure to refer to *each* of your figures and tables in the text. (In other words, summarize the main findings, but do not interpret them).

## **Discussion**

Answer the following questions:

- 1) What do your observations mean?
  - Summarize your most important findings in the context of your original research question(s) and indicate if you accept or reject your original hypothesis(es)
- 2) What conclusions can you draw?
  - Describe the pattern, principles, and relationships your results convey
  - Did your results meet your expectations based on the literature you cited in your introduction?
  - What additional research is necessary to resolve any unanswered questions, contradictions, etc.?
- 3) How do your results fit into the broader context of your research area?
  - What are the broader implications of your results?
  - What are the practical applications of your results?
  - How might your results be applied to other systems, species, and/or issues?

Other tips:

- Format should follow an upright triangle: move from your specific experiment to broader/general significance (i.e. move from your findings → broader scientific theory and practice)
- Clearly address whether you achieved your original goals and objectives
- Avoid speculation that cannot be adequately tested

## **Organization and flow**

It is very important to link the sections of your paper without being over-repetitive. The Introduction should set up the main hypothesis and the background, themes that are then picked up again in the Discussion section. The methods section should outline the means by which you are testing your hypothesis, and your results should summarize those tests. The opening paragraph in your Discussion section should then bring all of the threads together. State your hypothesis again in a sentence; provide a brief (1-2 sentences) summary of your overall findings. Then start tentatively with your interpretation of the significance of your findings. Then spend the rest of your discussion developing this interpretation. Explain your data in the context of your main question. Examine alternative explanations for your findings, but then explain why or why

not you think those explanations are reasonable for your findings (this is where you bring in previous studies and critically examine them in the context of your work). Again, be careful to not fall into the trap of providing overly long explanations or being diverted away from the development of your interpretation. Finally, end the discussion with a strong conclusion.

### **Final word**

Remember that less is more. Be clear and concise. If you can say the same thing with fewer words, do so (without sounding choppy of course). Good grammar and spelling are important. It is hard to see the quality of the work if the reader is bogged down in trying to understand your writing.

### **References**

University of Wisconsin – Madison. “Formatting Science Reports.” Accessed 1/6/2020.

<https://writing.wisc.edu/handbook/assignments/sciencereport/>