Writing a thesis (or report) - some recommendations

Working groups "Ecotoxicology & Environment"

Version 2022-02-14

Style

- Preferably use "Arial" (11pt) or any other standard style such as "Times New Roman" (12pt)
- Full justification (i.e., "block justification")
- Line spacing: 1.5
- Use page numbers and provide a table of content referring to the page numbers of the (sub)chapters.
- Lists of tables or figures are optional (only for theses)
- Use numbered chapters, but be aware that no text should appear under a headline (e.g., 5.1), if a further sub-chapter level (5.1.1; 5.1.2 etc.) exists. Text should always appear only under the lowest chapter level within a given main chapter.

Language

- Formal scientific language. This includes, for instance, the use of correct terms and being consistent, that is, to use the same term throughout the thesis and not to alternate terms because it may make the text sound less boring.
- English language and grammar must be at a high level
- Avoid overly long sentences (typical for Germans).
    - Aim for one subclause only per sentence
    - Start with the main point in your sentence, then add the condition / subclause
- Check logical connections between sentences. Use "therefore", "however", …
- Do not repeat (almost) complete sentences throughout the text.
- Use italics for genus and species names (e.g., *Limnephilus lunatus*). Abbreviate the genus names from the second time onwards (e.g., *L. lunatus*), except at the beginning of a sentence.
- The content should be easy to follow – always ask someone not involved in your subject or research area to read the text before handing it in to your supervisor.
- Read and comment others texts and publications as well in order to get used to scientific writing.
- Take any critical comment seriously. Think about how this comment can be addressed properly so that future readers will not end up with the same comment, concern or misunderstanding.

Content

Abstract

- Length: (1-page maximum, ideally only 7 to 10 sentences or ca. 250 words max).
- Capture only the key points.
- Place essential findings first.
- Ask yourself: What are the key results (ideally including the key data) and conclusions?

- First sentence(s): Why did you do the research? What are the hypotheses?
- Second sentence(s): What were your research aims and methods for gathering data?
- Remaining sentences: Key points and essential findings
- Last sentence: Outlook and how do the findings develop the research area?
- Use keywords (e.g., leaf litter breakdown or amphibian decline) that help to categorize your thesis thematically.

Introduction

- Usually the introduction starts rather broad and narrows down to the actual subject of your work.
- It includes important and new research findings (i.e., the state-of-the-art in the field) and refers to this literature. You can also incorporate references to textbooks for general findings. What knowledge does exist that most closely matches to the research area of your thesis?
- Develop a consistent "story" (prevent redundancies) that provides causal links between your statements and finally identifies the knowledge gap(s) that you wish to fill with your thesis.
- Briefly describe in the last paragraph how you plan to fill the identified gap (i.e., the used methods) and clearly state your hypotheses/research questions.

Material and Methods

- Provide a detailed description of the procedures, tools, equipment, statistics etc. that you have used (allow your experiments to be repeated by others) and justify their selection where appropriate.
- You can also include photographs of your set up or field site or a schematic drawing indicating the procedures and logical steps of your work. Your thesis is not a paper (yet) and therefore you have more space to provide details for the reader.
- Since the written thesis is also the basis for the evaluation by two reviewers and therefore the final grade, you should point out your effort (e.g., numbers of insects collected, number of samples for analysis, days of observation, …). Make, however, also very clear which parts of the work have been contributed by others.
- Make sure that the total number of samples and replicates are provided and are easily found. The reader should, for instance, immediately understand how many test beakers, individuals per beaker, and thus total number of individuals were used in the study. This allows a judgement of the study's replication and quality.
- Complicated procedures and their details (e.g., details on preparation of test concentrations, calibrations of equipment etc.) should be added in an Appendix.
- Remember to credit original authors of the methods you used; there is a high risk of plagiarism in the M&M part.
- Avoid presenting results in this section (some exceptions: e.g., results related to method development process or calibration of equipment).
- Ideally, this section is written in parallel to your data collection.

Results

- Describe the results that you obtained without interpretation (no discussion).
- Involve a reasonable number of tables and figures illustrating your findings (more information on figure and table preparation see below) to which you refer in the text when appropriate.
- Prepare the figures and tables and discuss them with your supervisor before starting

to write this section. Here you create the “flow” of your story.

- Results that you present must be interpreted in the discussion part. In case you want to present data that are worth noting but not that important in terms of the main story of your thesis, include these results in an Appendix.

Discussion

- Please consult with your supervisor, in case you want to combine Results & Discussion into one chapter.
- Develop a consistent “story” (prevent redundancies) that provides causal links between your statements
- How do your results relate to published data?
- How can the results be explained based on published knowledge? Make sure to compare your data to information from the literature that is as closely related to your work as possible. Yet, also consider other work.
- Discuss the results critically also against the background of uncertainty and methodological flaws if needed.
- What do your data mean in the larger scientific context and for the research field in general?
- Conclusion (may also be a stand-alone part)
    - What is the take home message from your work (after this work – “so what?”)?
    - Provide a brief outlook on research that needs to be done to further develop your insights
    - What might be implications in the environmental, regulatory or conservation management?
- Usually the discussion starts rather narrow and will become broader (i.e., more general), referring to more (general) literature.

Figures & Tables

- Information provided in a figure or a table must not be duplicated in text. However, you need to refer to each table and figure at least once in the thesis text.
- Number tables and figures in the order you mention them in the text.
- Information provided in a figure must not be duplicated in a table and vice versa.
- Figures
    - Display properly labelled x- and y-axes.
    - Label experimental treatments informatively; do not use codes used in the lab/field such as “treatment A”.
    - Show the data properly without influencing its impression.
    - Avoid distorting the data (e.g., by setting the minimum of an axis to suggest a smaller or larger effect).
    - Present many numbers with minimum ink.
    - Make large data sets (assuming you have one) coherent.
    - Encourage the reader to compare different pieces of data.
    - Caption including essential information must be printed below the figure.
- Tables
    - Reduce data sets to the smallest number of columns and rows possible.
    - Do not use excessive border lines (see Table 1). Never use vertical border lines, you may yet use additional horizontal border lines to indicate that a certain table header refers to more than one columns.
    - Use a consistent and meaningful number of digits for each variable.

- Caption including essential information must be printed above the table.

Table 1. Example of a properly formatted table

Variable A	Variable B		Variable E	
	Variable C	Variable D	Variable F	Variable G
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value
value	value	value	value	value

References

- Only use references of high scientific quality (preferably only peer-reviewed journal articles and books/book chapters).
- Do not use numbers for in-text-citations.
- Use a consistent style for in-text-citations.
- Provide a full bibliographic list of the literature cited in your work.
- All literature listed in the bibliography must be cited in the text and vice versa.
- Check your bibliography thoroughly for mistakes and inconsistencies (note that using bibliographic software does often involve entering wrong or incomplete information, which needs to be corrected by you). Also here: use italics for genus and species names (e.g., *Limnephilus lunatus*).

Appendix

- Provide a table of content informing the reviewer about the aspects covered in the Appendix.
- Complicated procedures and their details (e.g., details on preparation of test concentrations, calibrations of equipment etc.) can be provided here.
- Anything listed in the Appendix needs to be referenced in the text. Do not blindly add information in the Appendix that is not mentioned in your main text.
- Results that you present should be taken up in the discussion again, in case you want to present data that are worth noting but not that important in terms of the main story of your thesis, include these results in an Appendix.

Further reading

- Cargill, M., O'Connor, P., 2009. Writing Scientific Research Articles. Wiley-Blackwell.
- Heard, S.B., 2016. The scientist's guide to writing. Princeton University Press.

Note: although dealing with research articles rather than theses, these books are a useful start as both kinds of documents have much in common

Note: if you have any suggestions for amendments of this document, let your supervisor know.