BEHAVIOURAL ECOLOGY GROUP
THESIS AND INTERNSHIP GUIDE

WAGENINGEN UNIVERSITY

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In this thesis guide and on the Brightspace page "Thesis Behavioural Ecology", you will find all information and documents needed to successfully complete your thesis/internship with us at BHE. For general questions, please check the website first to find an answer, before emailing.

Good luck and have fun,

The Behavioural Ecology Group

PLEASE NOTE:
It is especially important that you follow the **BHE Thesis short guide checklist** on page 4 in this thesis guide in order to get yourself registered and to make sure that you have all the relevant information you need all along the way, from the start of your Thesis to finishing it.

Table of Contents

1. General Information

A thesis at BHE includes the following steps:

- Theis registration and contract
- Defining a research topic and question (together with your supervisor)
- Writing a research proposal
- MSc students present their research proposal at the BHE pre-colloquium
- Attending the bi-weekly BHE colloquia and monthly seminar
- Attending the alternating weekly journal club and informal thesis meetings
- Performing independent research & data analysis
- Writing your final thesis
- Presenting your final thesis at the BHE colloquium
- Examination (for MSc students and Internships only)

1.1. How to find a Thesis project

BHE offers a large variety of research topics and approaches ranging from literature studies, analyses of existing data, extracting data from video and audio recordings, or conducting own experiments at the Carus animal facilities or in the field.
Many, but not all, options are also listed on tip.wur.nl. We also highlight some of the options in our courses. If you found a topic, or would like to discuss other options within advertised projects, you can directly contact the respective supervisor.

If you are uncertain which specific direction you would like to go, please contact our thesis coordinator Bonne Beerda for general information.

Supervisors at BHE include:

- prof. dr. Marc Naguib (marc.naguib@wur.nl; link to homepage)
- dr. Bonne Beerda (bonne.beerda@wur.nl; link to homepage)
- dr. Sjouke Kingma (sjouke.kingma@wur.nl; link to homepage)
- dr. Alexander Kotrschal (alexander.kotrschal@wur.nl; link to homepage)
- dr. Lysanne Snijders (lysanne.snijders@wur.nl; link to homepage)
- dr. Filipe Cunha (filipe.cunha@wur.nl; link to homepage)
- dr Gretchen Wagner (gretchen.wagner@wur.nl; link to homepage)
- dr Séverine Kotrschal (severine.kotrschal@wur.nl; link to homepage)

2. BHE Thesis short guide checklist

Make sure you upload all the documents required in your personal Brightspace folder. Below you find more detailed information concerning each action point (where to find documents, whom to send documents to, etc.)

To do	When	How to	Whom it concerns	Done
Register & create **a personal folder** on the **thesis BHE brightspace page**	When contract is signed	Error! Reference source not found.**2.1**	all	**yes/no**
Upload your signed **contract** to your personal folder	When contract is signed	**2.2**	all	**yes/no**
Fill in & upload the **contact & emergency form** to your personal folder and obtain permission for travel abroad	Contact: When contract is signed Permission: well ahead of travel.	**2.3**	**ONLY** if you do field or laboratory work	**yes/no**
Register to the **BHE mailing list**	When contract is signed	**2.4**	all	**yes/no**
BHE photo board	When contract is signed	**2.5**	**ONLY** MSc students	**yes/no**
Access to **CARUS animal facility**	When contract is signed	**2.6**	**ONLY** If doing work in Carus	**yes/no**
Sign up for the **BHE Pre-colloquia presentation**	Pre-colloquium as discussed with supervisor	**2.7**	**ONLY** MSc students	**yes/no**
Upload *approved* draft & final **research proposal** to your personal folder	As agreed with supervisor	**3**	all	**yes/no**
Upload your approved thesis to your personal folder.	As agreed with supervisor	**4 -5,1**	all	**yes/no**
Sign up for the **BHE Colloquia final presentation**	In consultation with supervisor	**2.7**	BSc Biology and Forest & Nature Conserv. students have their own colloquia	**yes/no**
Arrange on a date for your examination	In consultation with supervisor	**6**	**ONLY** MSc and Internship students	**yes/no**
Make sure thesis and all data are submitted/with supervisor	Final step ☺	**7**		**yes/no**

2.1. Personal folder

Register on the bright space page "Thesis Behavioural Ecology" (https://brightspace.wur.nl (under ->discover--> enrol). Create your personal folder (LastName_FirstName_ThesisCode_Date in --> communication/groups. Upload all files required in this folder.

2.2. Contract

- Download the respective contract (module contract /"Thesis Behavioural Ecology").
- BSc Biology students: Will receive their contract per mail from the biology office (Tessa Holleman; office.biology@wur.nl).
- BSc Forest and Nature Conservation students: Can find the contract, thesis guide and assessment form on the BSc Forest and Nature Conservation Thesis Brightspace page (contact: Monique Heijmans; monique.heijmans@wur.nl)
- **Fill the contract in together with your supervisor and make agreements on the research topic and the scheduling of activities**
- Upload the signed contract to your personal folder (Biology BSc students, submit to the Biology Office; see Biology BSc guidelines https://brightspace.wur.nl/d2l/home/12984)). Forest and Nature Conservation BSc students, send a (digitally) signed copy of your BSc thesis contract (pdf) to monique.heijmans@wur.nl and petra.kloppenburg@wur.nl before the start of the thesis work).

2.3. Contact & Emergency form

If you do field- or laboratory-based work:

- Download the form from Brightspace (module Contact & Emergency form /"Thesis Behavioural Ecology"), fill it in, upload it to your personal folder.
- In case you go to a 'yellow' country (https://www.nederlandwereldwijd.nl), approval must be given by the director of the animal science group well in advance of your travel. The form can be downloaded here: https://www.wur.nl/en/Education-Programmes/Current-Students/Travel-policy-for-students.htm . Also be aware that vaccinations may be needed, so arrange this in time!. Travel to 'orange' countries is not permitted for thesis or internship work.

- It is important for us to know whom to contact/ how to react in case of an emergency.

2.4. BHE thesis E-mail list

This is done automatically if you are registered on the "Thesis Behavioural Ecology" Brightspace page. You can double-check your enrolment on the Brightspace "Thesis Behavioural Ecology" / communication /classlist.

2.5. BHE photo board

MSc students:

- MSc student are added to the BHE photo board such that we all know who is doing what at our group.
- You can find a template under the module photo board on the "Thesis Behavioural Ecology" Brightspace page.
- Fill it in and send it to your supervisor.

2.6. Access to CARUS

If you plan to do laboratory-based work at CARUS

- Read the guidelines for CARUS (module CARUS /"Thesis Behavioural Ecology")
- Fill in the CARUS registration form (module CARUS /"Thesis Behavioural Ecology")
- Send the registration form to mailto:office.bhe@wur.nl

2.7. BHE (pre) colloquia

- The BHE Colloquia currently take place via Teams biweekly on Thursdays (the secretary sends a link a few days before). When corona measures are lifted the colloquia will be in person again in Zodiac.
- Final thesis presentations by **MSc students and Animal Science BSc students**
- **MSc students also present their research proposal at the start of their thesis**

- Time slots are 20 min (Final thesis 15 min+ 3 min questions; Pre-colloquia 10 min + 10 min questions)
- Students are expected to attend all colloquia, except when practical thesis work does not allow it.
- Registration deadline is one week in advance with the secretary
- BSc Biology students have their own presentation sessions at the biology department (https://brightspace.wur.nl/d2l/home/12984 or contact person Tessa Holleman:office.biologie@wur.nl)

3. Guidelines for writing a research proposal

Prior to starting the practical work of a thesis, a research proposal must be written and approved. This proposal should contain the following elements:

- **Titlepage:** Title, Your name, Thesis code, Research Group(s), Supervisor, Date
- **Introduction:** Starts with a theoretical background which should lead logically to the specific question you plan to address. Provide a literature overview that sketches current knowledge of the topic and indicate knowledge gaps that your project aims to fill.
- **Specific aims and scope**: At the end of the introduction state the project's key objectives and the hypotheses or research questions you plan to test. Make (justified) predictions about your expected results. Consider including a plot illustrating your predicted results.

- **Methods:**
    - Describe when and where the study will be conducted.
    - If working with wild animals, provide information about the field site.
    - Describe the research design in relation to the following points:
    - Relate the design to your hypothesis.
    - If useful, consider including a flow chart illustrating your study design.
    - For studies on wild or captive animals, provide information about the animals, the data collection procedures, and the maintenance conditions and experimental treatments (if applicable). Include details such as sample sizes and how particular behaviours will be defined.
    - Describe which variables you will measure, and how you will analyse them (strategy for statistical analysis, tests, software).
    - Try to identify aspects of your study that may be hazardous and describe precautions that will be taken to minimize risks.
    - Make a time planning

- **References**: A list of the scientific articles and other sources cited in the proposal. Use a standard format, as in a scientific journal (such as Animal Behaviour or Behavioral Ecology).

4. Gathering & analyzing data

A thesis is part of a training towards becoming an independent scientist. As a scientist it is important to think of solutions yourself first, before asking for help. Yet, we hope that you take the opportunity to learn from your supervisor and critically discuss issues and questions with her or him.

What is expected from you:

- Make yourself sufficiently familiar with the topic and the literature so that you know why the question and approach you take is interesting and relevant and what it contributes to your research field
- Be proactive
- To work systematically and accurately from the beginning.
- Keep a Laboratory journal (or field book), if appropriate, in which all activities and contextual factors of the experiment are written down. It must be possible for the supervisor and others to trace what data was collected and in what way these have been obtained. Being organised is an important part of doing research!
- Also be aware that work in the field on wild animals can involve long working days and work on weekends and holidays, depending on the exact research topic.

4.1. Etholab (B0083) & Students rooms (E3207, B1035)

There are student rooms in Zodiac: E3207, B1035 and we also provide a special working environment (The Etholab).

The Etholab:

Is available for video and audio analysis with specialised software (for an overview of all available programs please see: module programs/"Thesis Behavioural Ecology").

- Clean desk policy
- It's not allowed to eat or drink in the Etholab.

Please contact the technical assistant for more information (lydia.nieuweweme@wur.nl).

4.2. Costs & reimbursement

Applies only for costs that were approved and discussed with the supervisor beforehand. In case you made such costs that need to be reimbursed (e.g. you were asked to buy small items or made other costs agreed with your supervisor).

How to obtain reimbursement:

- Original invoices are needed, signed with the initials of the student.
- Fill in the reimbursement form (module Reimbursement forms /"Thesis Behavioural Ecology") and get final approval from your supervisor. If you do not have a Dutch bank account contact the secretary: mailto:office.bhe@wur.nl)
- Send the reimbursement form as a WORD-file together with your signed invoice(s) and signed proof of payment(s) to your supervisor.
- If several payments are made: Make an overview of costs referring to the invoice(s) (number them if more than one) in the respective email.
- The supervisor then forwards this mail and its attachments to the secretary

5. Guidelines for writing your thesis

Your report will be formatted as a scientific article in the style of a journal like *Animal Behaviour*, *Behavioral Ecology* or similar. The relevant specifications below are directly adapted from the author guidelines of the journal: https://www.elsevier.com/journals/animal-behaviour/0003-3472/guide-for-authors

Article structure

All manuscripts must contain the essential elements needed to convey your research, for example Title page, Abstract, Keywords, Introduction, Methods, Results, Discussion, and References.

Essential title page information

The title page should contain a title, the thesis code, your your full name and registration number, date, abstract, and key words.

Title. This should be brief and informative. Avoid abbreviations.

Abstract. The Abstract should describe the purpose of the study, outline the major findings and state the main conclusions. It should be concise, informative, explicit and intelligible without reference to the main text. Abstracts should be limited to 300 words. Use both common and scientific names of animals at first mention in the Abstract unless they are given in the title. Avoid using references and statsical numbers.

Keywords. Immediately after the abstract, provide up to 5 keywords, in alphabetical order.

Introduction

Start the introduction with the general background of the topic covering key literature, and then progress to specific findings relevant to your study. The last paragraph of the introduction should introduce your study, using precise language such as: "Here we studied... to determine whether…". "We tested the hypothesis that…", "We predicted that…" etc. Clearly state your research question(s), and also mention any questions you added during data analysis by saying something like "We also tested whether..." You should omit a prediction if you did not have enough information to specify one beforehand: it is never appropriate to state hypotheses/predictions you only made after collecting/analyzing the data ("post-hoc" predictions).

Methods

Provide sufficient detail to allow the work to be reproduced.

This section should include a description of the research site and time the material, how you chose which data to collect, how you collected the data, whether the data underwent any further processing (e.g. combining related measurements into an overall 'score'), and finally how the data were analysed statistically. Write in the past tense, i.e. what you actually did, not what you wanted to do. If you used different methods for different research questions, clearly separate them and present them in the same order in the results section. Write in active voice (we observed, we analyzed, etc.) where appropriate.

Always state sample sizes (the number of animals used in the study) and the age, sex, breed/strain and source of animals, when known. Describe why any data was excluded from analyses. Full details of testing or observational regimes should be given. The Methods section should also contain a description of the kinds of statistics used and the activities that were recorded.

Results

Results should be clear and concise. Write in an active voice (e.g. better state 'Female were significantly more active than males' rather than 'A t test between males and females was significant'). This section should focus on results that are relevant to the hypotheses outlined in the Introduction and considered in the Discussion. Use Figures and possibly Tables to illustrate your main results. The text should complement material given in the Tables or Figures but should not directly repeat it. Give full details of statistical analysis either in the text or in Tables or Figure legends. Include the type of test, the precise data to which it was applied, the value of the relevant statistic, the sample size and/or degrees of freedom, and the probability level. Number Tables and Figures in the order to which they are referred in the text.

Means and standard errors/standard deviations (and medians and interquartile ranges/confidence limits), with their associated sample sizes, are given in the format X +SE = 10.20+1.01 g, N = 15, not X = 10.20, SE = 1.01, N = 15.

For significance tests, give the name of the test followed by a colon, the test statistic and its value, the degrees of freedom or sample size (whichever is the convention for the test) and the P value (note that F values have two degrees of freedom). The different parts of the statistical quotation are separated by a comma. Note use of italics for F, P, N and other variables.

If the test statistic is conventionally quoted with degrees of freedom, these are presented as a subscript to the test statistic. For example:

ANOVA: $F_{1,11} = 7.89$, $P = 0.017$
Kruskal-Wallis test: $H_{11} = 287.8$, $P = 0.001$
Chi-square test: $X_{22} = 0.19$, $P = 0.91$
Paired t test: $t_{12} = 1.99$, $P = 0.07$

If the test is conventionally quoted with the sample size, this should follow the test statistic value. For example:

Spearman rank correlation: $r_s = 0.80$, $N = 11$, $P < 0.01$
Wilcoxon signed-ranks test: $T = 6$, $N = 14$, $P < 0.01$
Mann-Whitney U test: $U = 74$, $N1 = N\,2 = 17$, $P < 0.02$

P values for significant outcomes can be quoted as below a threshold significance value (e.g. $P < 0.05$, 0.01, 0.001), but wherever possible should be quoted as an exact probability value. Departure from a significance threshold of 0.05 should be stated and justified in the Methods. Marginally nonsignificant outcomes can be indicated as exact probability values or as $P < 0.1$. Nonsignificant outcomes should

be indicated with an exact probability value whenever possible, or as NS or P > 0.05, as appropriate for the test.

State whether a test is one tailed or two tailed (or specific or nonspecific in the case of Meddis' nonparametric ANOVAs). One-tailed (or specific) tests should be used with caution. Their use is justified only when there are strong a priori reasons for predicting the direction of a difference or trend and results in the opposite direction can reasonably be regarded as equivalent to no difference or trend at all. Authors are referred to Kimmel (1957, Psychological Bulletin, 54, 315-353).

Do not quote decimals with naked points, for example quote 0.01, not .01, or normally to more than three decimal places (the exception being P values for significance tests, which may be quoted to four decimal places where appropriate, e.g. 0.0001).

Transformations. Where data have been transformed for parametric significance tests, the nature of the transformation and the reason for its selection (e.g. log x, x 2, arcsine) should be stated.

Figures and Tables

- Make sure you use uniform lettering and sizing.
- Preferred fonts: Arial (or Helvetica), Times New Roman (or Times), Symbol, Courier.
- Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article.

Figure captions

Ensure that each illustration has a caption. A caption should comprise a brief title (not on the figure itself) and a description of the illustration. It should not repeat results given in the text. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

Discussion

It is often helpful to begin the Discussion with a summary of the main results. The main purpose of the Discussion, however, is to comment on the significance of the results and set them in the context of previous work. The Discussion should be concise and not excessively speculative.

Start by summarising the main findings (e.g. “Here we show that...”) but do not reiterate specific numerical results or refer to figures and tables. You should then discuss your findings in the context of (1) your predictions and (2) the background

established in your introduction, including reference to previous results in the scientific literature. A discussion must link your results to other studies, thus a discussion without references is not acceptable. Distinguish between biological and methodological explanations. Some projects may not yield significant results, however negative results are part of science and can still be discussed adequately. If you discuss limitations of your study, do not focus exclusively on these but do so along with your discussion of that specific aspect of the study, rather than making a separate paragraph where all limitations are listed. With careful wording you can indicate how strongly your data supports the conclusions you draw; be more cautious in interpreting results from questions you came up with while analysing the data.

The main conclusions of the study may be presented in a short final conclusions paragraph (or separate section). Make sure your conclusion is not just a repetition of your results. End with what you have shown rather than with what you have not shown..

References

Citations in the text

Check that all references in the text are in the reference list and vice versa, that their dates and spellings match, and that complete bibliographical details are given, including page numbers, names of editors, name of publisher and full place of publication if the article is published in a book. Unpublished results are not recommended in the reference list. If these references are included in the reference list, they should follow the standard reference style of the journal. Check foreign language references particularly carefully for accuracy of diacritical marks such as accents and umlauts. For papers in the course of publication, use 'in press' to replace the date and give the journal name in the references.

Reference formatting

Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. All references need to be formatted in the same way

Reference style

Text: Citations in the text should follow a standard referencing style
One author: (Field, 2005)
Two authors: (Gass & Varonis, 1984)

Three or more authors: (Tremblay *et al*., 2010)

List: References should be arranged first alphabetically and then further sorted chronologically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', 'c', etc., placed after the year of publication. Note that journal titles in the reference list should be written in full.

For publications in any Latin script language other than English, give the original title and, in brackets, the English translation. Titles of publications in non-Latin scripts should be transliterated. Work accepted for publication but not yet published should be referred to as "in press". Cite "personal communications" in the text only. Provide the initials and surname(s) for personal communications and give the date of the personal communication (as exact as possible), separated by a comma (A. Smith, personal communication, 9 September 2013).

Examples:

Reference to a journal publication:
Van der Geer, J., Hanraads, J. A. J., & Lupton, R. A. (2010). The art of writing a scientific article. Journal of Scientific Communications, 163, 51–59. https://doi.org/10.1016/j.sc.2010.00372.

Reference to a book:
Strunk, W., Jr., & White, E. B. (2000). The elements of style (4th ed.). Longman (Chapter 4).

Reference to a chapter in an edited book:
Mettam, G. R., & Adams, L. B. (2009). How to prepare an electronic version of your article. In B. S. Jones, & R. Z. Smith (Eds.), Introduction to the electronic age (pp. 281–304). E-Publishing Inc.

Reference to a website:
Powertech Systems. (2015). Lithium-ion vs lead-acid cost analysis. Retrieved from http://www.powertechsystems.eu/home/tech-corner/lithium-ion-vs-lead-acid-cost-analysis/. Accessed January 6, 2016

Reference to a dataset:
[dataset] Oguro, M., Imahiro, S., Saito, S., & Nakashizuka, T. (2015). Mortality data for Japanese oak wilt disease and surrounding forest compositions. Mendeley Data, v1. https://doi.org/10.17632/xwj98nb39r.1.

Reference to a thesis:

Brewis, J. M. (1981). The population dynamics and growth of the freshwater crayfish Austvopotamobius pallipes in an aqueduct in Northumbria (Doctoral thesis). Durham, U.K.: Durham University. Retrieved from http://etheses.dur.ac.uk/7546/

In general, the writing should be factual (e.g. explain what was done and found in earlier studies), precise, concise and explicit. Make transparent what was done in your study, and what underlies the claims and statements made in earlier studies. As a good inspiration, check published papers for how they have written and structured the text.

Plagiarism will be checked upon uploading your Thesis and will bereported to the exam committee. Plagiarism can have serious consequences!

5.1. Handing in your Thesis

- After approval of the thesis by the supervisor, upload your thesis as word document to your personal folder.
- Format of the file: Lastname_Firstname_Thesiscode-Year of finish.

6. Examination & Grading

The grading follows the grading forms for the different types of theses/internships a available on Brightspace.

MSc and Internship students:

- Your final grading includes an oral exam
- This oral examination is a discussion about the content and the broader framework of the thesis, in which knowledge, understanding, insight, but also creativity and scientific attitude are evaluated. The final examination will be conducted by your supervisor and one of the other staff members.
- The exam should be scheduled together with your supervisor towards the end of the thesis.

The final mark will be conducted by your supervisor and one of the other staff members. The final mark of the thesis will be based on several criteria:

1) Research competence
2) Thesis (+self reflection for Internships)

3) Colloquium
4) Examination

You can find the evaluation form with the relative weighting of these categories under the module evaluation forms on the Brightspace page "Thesis Behavioural Ecology.

BSc Animal Sciences:

- Your grading does not include an oral exam.
- The final mark will be conducted by your supervisor and one of the other staff members. The final mark of the thesis will be based on several criteria:
    1) Research competence
    2) BSc Thesis
    3) Colloquium
- You can find the evaluation form with the relative weighting of these categories under the module evaluation forms on the Brightspace page "Thesis Behavioural Ecology.

BSc Biology and Forest and Nature Conservation students:

- Your grading does not include an oral exam
- Your final mark will be given by the Biology department.
- The final mark of the thesis will be based on several criteria:
    1) Research competence
    2) Logbook (if applicable)
    3) BSc Thesis
    3) Colloquium
- You can find the evaluation form with the relative weighting of these categories under the module evaluation forms on the Brightspace page "Thesis Behavioural Ecology.

7. Data storage

- Provide used materials of the BHE group to our technical assistant, Lydia Nieuwe Weme (note that individual projects may have own equipment, which should be returned to the supervisor]
- Discuss data storage with your supervisor.
- If your data is an Excel file upload it to your personal folder
- If it contains larger files (Videos/auditory files etc.) Lydia will save it on an external harddrive for long-term storage

- Make sure the variable names in your data sheets are self-explanatory – add a 'read-me' tab of needed.
- Upload/ provide your Rawdata AND your Finaldata (if not congruent) and R-code if applicable.
- Format: lastname, firstname_thesiscode_year of finish_Rawdata/Finaldata
- Note that the final grade will only be entered once these steps are taking or discussed