Logotype for the Faculty of Science.Department of Biology  
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BASIS FOR PRELIMINARY INDIVIDUAL STUDY PLAN

# Preliminary plan for the education and thesis project

The individual study plan should be established as soon as possible after the PhD student is admitted. There the four-year education should be planned by the supervisors and the departmental representative, following the general syllabus, and the resources tied to the education should be specified. The content and implementation of the research project is primarily the responsibility of the supervisors, and the departmental representative can play a role in overall planning of the education; making sure that it facilitates an appropriate level and scope of learning and that there is room for the PhD student to influence the direction of the research project, foreseeing risks, and feasibility aspects. The individual study plan should consider the background, educational needs, and interests of the PhD student. Thus, this document is to support the overall planning, and can be used as a starting point when formulating the actual ISP. Purple sans-serif text is an example to illustrate the level at which planning can be made before admitting the student.

## 1. Supervising committee

It is the responsibility of the PhD student to carry through the education and learn what is required to reach the goals. It is the responsibility of the supervisors and departmental representatives to plan and follow up on the education.

Main supervisor: Anna Andersson

Co-supervisor(s): Bengt Bengtsson

Departmental representative: Carin Carlsson

## 2. Thesis subject

### Blooms like it hot – or not: the effect of extreme weather events on algal blooms

The thesis will investigate the effect of extreme hot and dry weather events in conceptual models for future algal blooms. The specific aims include determining how widespread community shifts were in Sweden during a drought event in 2018, to which extent spring temperatures determine bloom composition, and whether drought reduced nutrient inputs allow for cyanobacteria to be outcompeted by dinoflagellates (or functionally similar taxa). The focus for these studies is eutrophic lakes that serve as drinking water supplies and that have recurring problems with cyanobacterial blooms.

## 3. Area within the PhD program subject (biology) that the education should encompass

Biology is an exceptionally wide subject, while the thesis subjects is typically very specific. The area within the program that the education of the individual student is somewhere in between that very wide and very specific level.

Aquatic ecology in general and phytoplankton ecology in particular, community ecology, climate change effects on aquatic ecosystems

## 4. Mandatory courses and undertakings

* Graduate studies in biology: the science and its philosophy (1.5 credits)
* Evolutionary processes (2 credits)
* Research ethics (3 credits)
* Faculty wide introduction course for PhD students (0.5 credits)
* Course on teaching in higher education, or corresponding course that meets the general outcome of supporting the learning of others (3 credits) – for instance, Learning and Teaching in Higher Education - Theory and Practice (4.5 credits)
* Mid-term review (15 credits)
* ’Studies for broadening within the research area (in accordance with area specified under #3)’ (5 credits)\*
  + Literature course about the research field of limnology (10 credits)
  + Climate change effects on aquatic ecosystems (3 hp)
* Presentation and participation in international conferences (min 3 credits) Suggestions:
  + BLAM 2021
  + Harmful algal blooms meeting 2022
  + Association for the Sciences of Limnology and Oceanography 2023

## 5. Elective courses or undertakings which the departmental representative considers to be relevant and complementary to the research project and mandatory components of the education (27 hp)

(For instance, PhD courses, active participation in international conferences, literature-based activities)

* Statistics for biologists 7.5 credits
* DNA amplification technology 3 credits

## 6. Components in the thesis work (What will be included, a rough time plan, risk factors, contingency plans)

### Sub-project 1

A dataset over the plankton community composition in two lakes during 2018 and 2018 exists, and this will be extended by intensive field sampling for 2 more years. The purpose is to understand which factors can explain a drastic shift in community composition in one of the lakes in the hot and dry summer of 2018.

#### Important tasks

planning and execution of field work, analytical techniques (toxin analysis, microscopy, flowCam), evaluation of data based on theories of how abiotic and biotic factors control the community composition of plankton, statistics.

#### Risks and potential solutions

Low risk.

### Sub-project 2

Through lab experiments study how the temperature affects recruitment of dinoflagellates and cyanobacteria.

#### Important tasks

design, plan and execute lab experiment, to evaluate the effect of temperature on recruitment

#### Risks and potential solutions

The method is not established and there is a risk that the project does not generate data. Gives training in method development and problem solving. If it turns out that to be a blind alley the other sub-projects can lead the way to other lab experiments that can evaluate other aspects of succession and competition.

### Sub-project 3

Competition experiments to evaluate if dinoflagellates have a competitive advantage over cyanobacteria under phosphorus limitation.

#### Important tasks

Design, plan and execute lab experiments to evaluate the outcome of competition at various nutrient conditions, maintain algal cultures

#### Risks and potential solutions

Low risk, since the group has experience with this type of experiments.

### Sub-project 4

To study shifts in plankton community composition in other lakes and look for explanatory patterns.

#### Important tasks

To analyse a larger and more complex dataset than that in sub-project 1 and to evaluate to what extent the results are generalizable.

#### Risks and potential solutions

Low risk

### The project overall

The combination of field data and mechanistic experiments multiple is a strength. Likewise, the broad repertoire of end points and response variables is a strength. Sub-project 1 will happen first, and parallel to this sub-project 4 will be initiated. The outcome of the analyses in sub-project 4 can influence the final choice of driving variables and treatment levels in sub-projects 2 and 3. There are possibilities for the PhD student to influence the direction of the project both within the proposed sub-projects and by additional components.

The overall risk of the entire project is very low. Should sub-project 2 fail, the PhD program will not fail. Also ’negative results’ will be informative and support learning.

## 7. Activities that promote learning but that do not award credits

All PhD students should be integrated in research environment that is scientifically relevant, research active, and promotes learning. Connection among PhD students should be promoted also at the unit and departmental level. List environments and how the student will participate

* Research group – biweekly group meetings in the Plankton community group, biweekly journal club with Plankton community group
* Unit – biweekly seminar series at unit, annual unit meeting
* Department – seminar series, BLAM

All PhD students should have the opportunity to a reasonable teaching commitment that promotes the PhD studies. List courses where the PhD student could be engaged in teaching

Ecology, Limnology, Water management, Aquatic ecology

### Other

Present at Vattendagarna. Participate in citizen science project linked to the research project.

## 8. Infrastructure and resources required for the project apart from salary costs

* Office and lab space – provided by the department
* Cell sorter – available at the unit
* Equipment for field work and experiments - everything available at the department or at LTH for a cost financed by Formas (~100 kkr)
* Support with taxonomy – external service from Ekol, covered by Formas (~40kkr)
* High throughput genomics analyses, SciLife (~200kkr)
* Conference fees, travel and board – at least one financed by Formas (~25kkr)
* Open access-publication – Formas-grant (~50 kkr)
* Access to databases – public access

The student is encouraged to apply for various stipends to also finance travel costs, conference fees, field, and lab work.

## Goals for doctoral exam

All activities within the education should promote learning in relation to the goals of the higher ordinance.

### Knowledge and understanding

For the degree of Doctor, the PhD student shall

1. demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and

#### Broad – The Biology subject

Evolutionary processes, Introductory course: Graduate studies in biology: the science and its philosophy, seminar series at department level, BLAM, teaching

#### Area within the Biology subject (point 3 above)

Literature seminars, unit seminars, research conference, excursion, research visit, teaching

#### Specialist

Thesis work, research conference, research visit, literature seminars, mid-term review

1. demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

#### In general

Introductory course: Graduate studies in biology: the science and its philosophy, thesis work, journal club, teaching, scientific conference, methods courses, course in research ethics, ethics course on experimental animals

#### The specific field

Thesis work, teaching, scientific conference, methods courses, mid-way review

### Competence and skills

For the Degree of Doctor, the third-cyc1e student shall

1. demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues, and situations autonomously and critically

Thesis work, teaching, journal club, write scientific papers, publish in scientific journals, insight in peer-review process

1. demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously, and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work

Thesis work, midway review, “kappan”, apply for research funding, Finish on time (course), project management (course), supervision

1. demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research

Thesis work, midway review

1. demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and society in general

Conference presentation, publishing scientific papers, BLAM, teaching, participation at NMT-days, Biology Day, the thesis and the popular summary of the thesis, contacts with media, supervision, course in scientific writing

1. demonstrate the ability to identify the need for further knowledge and

Thesis work, midterm review, “kappan”, apply for research funding, journal clubs

1. demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.

Teaching, course in learning and teaching in higher education, supervision, thesis work, scientific publishing, popular summary of thesis, media contact, “Fråga en biolog”

### Judgement and approach

For the Degree of Doctor, the third-cyc1e student shall

1. demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of

Course in Research ethics, “kappan”, thesis work, ethics course on experimental animals, presentation in scientific conference

1. demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.

Course in Research ethics, Introductory course: Graduate studies in biology: the science and its philosophy, thesis work