

Studieplan 2016/2017

Master in applied ecology

Studiepoeng: 20

Studiets nivå og organisering

The master in applied ecology is a full time study over 2 years, consisting of 120 ECTS credits according to § 3 in 'The regulation of requirement to a master degree appointed by the Ministry of Education and Research July 2nd, 2002 ("Forskrift om krav til mastergrad" fastsatt av Utdannings- og Forskningsdepartementet den 2. juli 2002). Half of the study (60 credits) consists of a master thesis in applied ecology. The course load consists of 45 ECTS credits of compulsory and 15 ECTS credits of optional courses.

Bakgrunn for studiet

Through evolutionary time species have gone extinct, sometimes in the form of mass extinctions. The background or 'natural' extinction rate is, however, negligible compared to the impact of man on species survival. The extinction of species today is estimated to be 100-1 000 times higher than the background extinction rate, estimated as the average extinction rate over the last 100 million years. There is good evidence that we are now approaching another mass extinction which would be solely due to human activity and surpass in extent any previous mass extinction.

Of the 13 million species assumed to be present in the world today, only 1.8 million have been scientifically described and named. The eradication of species, even before they have ever been described, is one of the major environmental threats today. In Norway alone, ca 15 000 species have been assessed as threatened, and as many as 3 000 species exist in the national 'red list' of species most vulnerable to extinction. Among the larger, most conspicuous species in Norway, 30 and 25 % of all mammals and birds, respectively, belong to the red list.

Extinction of species reduces biodiversity and its inherent value. More concretely the instrumental, or utilitarian, value of biodiversity is reduced by decreasing humans'

possibilities to acquire goods (e.g. food, fuel, fibre and medicines), services (e.g. pollination, recycling, nitrogen fixation, homeostatic regulation), information (e.g. genetic engineering, pure science) and psycho-spiritual values (aesthetic beauty, religious awe, scientific knowledge) [1].

The extinction of species also contravenes human intentions for sustainable development as agreed in international conventions [2]. Even though the understanding of extinction of species is highly dependent on evolutionary and ecological processes, there is a need today to incorporate such knowledge with an understanding of human impacts on ecosystems. In the present program we will focus on the biological processes and the scientific tools needed to understand and acquire knowledge about sustainable development of ecosystems, aiming to provide the competence needed among the many practitioners in the professional areas of education, management and research who will influence the sustainable development of our future.

Applied ecology

Ecology is the scientific study of the interactions that determine the distribution and abundance of organisms [3]. The 'applied' perspective often refers to how ecological knowledge can be used to achieve specific aims. The aims may be associated with the exploitation of natural resources, for instance as a sustainable harvest, or equally with the protection of the biodiversity of ecosystems. Human impacts such as habitat destruction and fragmentation, harvesting, biological control, the introduction of alien species, and discharge of environmental poisons or climatic gasses all contribute to changes in the environment. Today these changes are occurring at a much faster rate and to a greater extent than species are able to adapt to. However, ecological knowledge may be used to reduce the detrimental effects. For instance, remedial actions such as specific harvesting strategies or a landscape approach to areas of expansion may allow sustainable development between man and the environment. Sustainable development does, however, demand specific methods for monitoring the natural environment to identify deviations from the aims of management. Hence, in the present master program in applied ecology we focus on:

- 1) The ecological effects of human impact in nature;
- 2) The ecological effects of remedial actions;
- 3) Sustainable utilisation of natural resources; and
- 4) Wildlife- and habitat monitoring.

'Applied' in the present study program also refers to the ability to carry to completion a

substantial piece of original research. We aim to train students to be able to plan, conduct, analyse and present results from ecological studies with management applications. Besides a strong foundation in the discipline of ecology, this requires knowledge of novel technology, mathematical and statistical skills, as well as a good command of English which is the scientific language. We attach importance to the students' ability to acquire information and be critical of the sources referred to. Seminars and discussions enhance students' abilities to evaluate 'accepted truths in ecology', and results and interpretations from other studies.

Despite the discipline of ecology being neutral in value, several topics in ecology touch on areas of conflicting values. Knowledge of the development of human ethical principles and attitudes is important to be able to communicate with various social groups that need ecological results. Hence, to complete the 'applied' perspective, a knowledge of social sciences as well as the development of communication skills, will run like a connecting thread throughout the study.

Why a master in applied ecology?

International conventions require a continuously higher level of consciousness regarding the use of natural resources and wildlife- and habitat monitoring. Norway, and the Nordic countries in general, hold a unique position in this context with large, relatively intact, wildlife areas which we have a special responsibility to utilise in a sustainable way. As far as we know, we are the first educational institution in Norway, and among the Nordic countries, to offer a master degree in applied ecology. Except for the University of Stavanger, all the universities in Norway either offer a master in ecology, or offer ecology as a major area of study within a master in biology. Characteristic of the master in ecology offered at the other institutions in Norway, is the focus on ecology as a basic science.

The master in applied ecology is also unique in Norway because it is taught in English to give it an international perspective, and because theory and practice follow each other continuously during the study. The emphasis of the research program is on empirical research addressing questions relevant to regional wildlife management.

[1] See e.g. Meffe, GK and Carroll, CR 1997. Principles of conservation biology. Sinauer Associates Inc. Publishers, Massachusetts.

[2] See e.g. <http://sustainabledevelopment.un.org/index.html> ; http://www.regjeringen.no/nb/dep/md/tema/internasjonalt_miljosamarbeid.html?id=1186

[3] Krebs, CJ. 2009. Ecology. Benjamin Cummings.

Læringsutbytte

The learning outcome is a result of the master thesis, participation in the educational component and participation in an active research environment. By completing the master program in Applied Ecology the candidate shall:

Knowledge

- know advanced topics in applied ecology
- have an in-depth knowledge of ecological topics at scales from individuals to global systems
- understand human impacts due to harvesting, introduction of alien species, habitat destruction and fragmentation, population control, pollution and climatic changes

Skills

- conceive, plan and carry to completion a substantial piece of original research under the supervision of a professional in the field
- apply ecological methodology such as study design, statistical modeling, ecological technologies and analysis of wildlife and habitat monitoring
- communicate and participate in discussions on current controversial issues in ecology and the application of the science

Competence

- be able to design and carry out monitoring, management and minor research projects
- be able to communicate applied research through national or international publishing channels, and to policy makers, stakeholders and the general public
- be able to present and debate important topics in the field of applied ecology in regional and national forums

Målgruppe

Our aim is to target students and professionals who have a dedicated interest in wildlife, and the interaction between man and the environment. Herein we target professionals within wildlife management who want to extend their competence in the field of ecology above the level of a bachelor.

Primarily we target students with a bachelor in ecology, (wildlife) biology, evolution, environmental sciences or such like. However, we encourage applicants with other bachelor degrees, or who can show an interdisciplinary bachelor degree, as long as they fulfill the entrance requirements

Relevans for arbeidsliv og videre studier

The master degree in applied ecology qualifies the student to:

- Work as a research assistant, for instance with environmental impact assessment or wildlife- and habitat monitoring
- Work in decision making in private and public wildlife management at all levels from licensees, local authorities and ministries.
- Work at educational institutions. Additional pedagogic background may be needed dependent on institutional requirements
- Enter a PhD-program in biology or likewise for a further career in research

Opptakskrav og rangering

Requirements for admission

To enter the programme, students are required to confirm the achievement of either:

- A Norwegian bachelor degree, or an education recognized as being equivalent to a Norwegian bachelor degree
- An education recognized as three years of higher education in Norway
- Education approved as equivalent to the above-mentioned degrees according to university law § 3-4

The degree from higher education has to include the equivalent of at least 80 ECTS credits of the following subjects:

- Minimum 7.5 ECTS-credit equivalents in statistics or similar topics
- Minimum 72.5 ECTS-credit equivalents in biology, zoology, botany, evolution, wildlife biology, environmental sciences, or other relevant topics

The study may be limited to a certain number of students decided yearly. In this case the ranking of students will follow the average weighted (ECTS credits) marks from their degree in higher education.

All non-native English speakers must provide official documentation of English language proficiency at the level of Norwegian upper secondary school/high school. English must have been the primary foreign language in at least seven years in primary, secondary and upper secondary school, alternatively an A-level exam in English. Applicants who do not fill these requirements, or are not sure that they do must take one of the following tests:

- TOEFL with a score of 500 (written), 170 (computer based), 60 (internet based)
- IELTS with a score of 5.0

No exceptions are made to this requirement. Scores lower than 500/170/60 (TOEFL) or 5.0 (IELTS) will not be accepted. The TOIC test will not be accepted

Arbeids- og undervisningsformer

Lectures followed by practical exercises both in the field and in the computer-lab. There will also be extensive use of seminars by student presentations and discussions as well as presentations by invited external professionals. See chapter 12 for a detailed

description.

Praksis

Vurderingsformer

See description of courses below.

Forskningsbasert undervisning

Internasjonalisering

We propose the master in applied ecology to be taught in English. This to allow for international applicants, and to create an international student environment that will improve the quality of the study, not least through discussions of various 'schools' in ecology and human attitudes. We will encourage and make allowances for students who wish to study abroad for part of their degree. Such an international stay is recommended to take place during the second and/or third semester of the study depending on the courses the student may achieve abroad. In addition, we will accept qualified external supervisors of the master thesis from international universities and university colleges. Hence, an international stay may be used to carry out part of the master thesis.

Hedmark University College has several international agreements of collaboration. Specific to the Faculty of Forestry and Wildlife Management there are active student exchange programs with:

- University of Applied Sciences, Eberswalde, Germany
- Arnt-Moritz-University Greifswald, Germany
- University of Applied Sciences, Weihenstephan, Germany
- University of Freiburg, Germany
- School of Forestry, Basna Stiavnica, Slovakia
- Zvolen University, Slovakia
- Pacific Lutheran University, USA
- North Dakota State University, USA

The faculty also has student- and staff exchanges with the University of Fairbanks, Alaska, and African Wildlife Management College, Tanzania, and an agreement of intention with 12 Nordic institutions to cooperate on joint degrees in 'Nordic Ecosystem Management'.

Studiets oppbygging og innhold

Year	Block 1	Block 2	Block 3	Block 4
1	Concepts in ecology (7.5)	Human impacts on ecological systems (15)	Human dimension in ecosystem management (7.5)	Optional
	Study design and statistical modelling (7.5)		Optional	
			Master thesis	
2	Optional	Current topics in applied ecology (7.5)	Optional	Optional
	Master thesis			
Optional courses	Advanced statistical modelling (2.5)		Tropical wildlife: Ecology, management and utilisation (7.5)	Population monitoring using Distance sampling (2.5)
	Multivariate statistics in community ecology (2.5)		Population monitoring using Capture Mark Recapture (2.5)	Population monitoring using radiotracking (2.5)
				Analysis of spatial animal data (2.5)
			The optionals in block 3 will alternate and run each 2nd year	Specialisation (7.5, year 2)

Courses

Emnekode	Emnets navn	S.poeng	O/V *)	Studiepoeng pr. semester			
				S1(H)	S2(V)	S3(H)	S4(V)
6EV310	<u>Concepts in ecology</u>	7,5	O	7,5			
6EV311	<u>Study design and statistical modelling</u>	7,5	O	7,5			
6EV320	<u>Human impacts on ecological systems</u>	15	O	15			
6EV322	<u>Human dimension in ecosystem management</u>	7,5	O		7,5		
6EV325	<u>Topics in applied ecology</u>	7,5	O			7,5	
6SU399	<u>Master thesis in applied ecology</u>	60	O			30	30
6EV314	<u>Population monitoring using radiotracking</u>	2,5	V				
6EV314	<u>Population monitoring using radiotracking</u>	2,5	V				
6EV315	<u>Chemical and physical capture of Scandinavian Mammals</u>	2,5	V				
6EV316	<u>Tropical wildlife - ecology, managemnet and utilisation</u>	7,5	V				
6EV321	<u>Advanced statistical modelling</u>	2,5	O				
6EV323	<u>Multivariate statistics in community ecology</u>	2,5	V				
6EV324	<u>Analysis of spatial animal data</u>	2,5	V				
6EV327	<u>Population monitoring using Capture Mark Recapture</u>	2,5	V				
6EV328	<u>Population monitoring using Distance sampling</u>	2,5	V				
Sum:				30	7,5	37,5	30

*) O - Obligatorisk emne, V - Valgbare emne

Emneoversikt

6EV310 Concepts in ecology

Emnekode: 6EV310

Studiepoeng: 7,5

Semester

Høst

Språk

English

Krav til forkunnskaper

None

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

A broad understanding of central concepts in ecological theory, with emphasis on evolution, behavioural ecology, population biology and community ecology.

Skills:

Become familiar with the process of reading, understanding and writing scientific literature.

General competence:

Acquire the ability to evaluate ecological research, and learn to communicate and participate in discussions on the application of ecological theory in practical conservation and management.

Innhold

Central topics in ecological theory, with focus on evolution, behavioural ecology, population biology and community ecology. Extensive training in analyzing research publications and reports, and critically reviewing the aim, methods and conclusions. Thereby learning the process of scientific writing. The students will be introduced to study design and learn how to analyse and discuss data from ecological studies by producing two shared reports with the course in Study design and statistical modelling. This course establishes the basis needed for the subsequent course Human impacts on ecological systems.

Arbeids- og undervisningsformer

Lectures, seminars and exercises. Some exercises will be given in combination with the course Study design and statistical modelling. The introduction and discussion part of these reports from these exercises counts for the course Concepts in ecology. The methods and results counts for the course Study design and statistical modelling. Seminars will include presentations and discussions by student groups.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Eksamen

- two written reports (count 20% each)
- individual written exam (60%).

Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV311 Study design and statistical modelling

Emnekode: 6EV311

Studiepoeng: 7,5

Semester

Høst

Språk

English

Krav til forkunnskaper

None

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

- The student has a good understanding of basic statistical concepts and terminology.

Skills:

- The student can apply statistical models in ecology and interpret model outcomes and predictions.
- The student is able to present statistical results in scientific publications.

General competence:

- The student is familiar with the use and limitations of statistics in ecology.

Innhold

The course starts with basic statistics and progresses towards (more) advanced concepts and methods in statistical modelling.

The following topics are covered:

- Basic statistical concepts and terminology (sampling, variation, probability, modelling, inference etc.)
- Descriptive and exploratory data analysis (data manipulation, graphics, use of the R environment etc.)
- Basics of study design and connexion with statistical modelling.
- Null Hypothesis Scientific Testing
- Presentation of statistical results
- More advanced concepts used in modern statistics (e.g., parsimony, likelihood, model selection)
- Linear and Generalized Linear Models (as the foundation for many statistical methods used in ecology)

Arbeids- og undervisningsformer

Lectures and exercises / assignments. Some assignments are common with the course Concept in Ecology

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Complete written reports and additional exercise.

Eksamen

- Assessment of a portfolio including two written reports and one exercise (45%).
- Oral exam (55%).

Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV320 Human impacts on ecological systems

Emnekode: 6EV320

Studiepoeng: 15

Semester

Høst

Språk

English

Krav til forkunnskaper

The following courses of the master in applied ecology or equivalent courses from other universities: Concepts in ecology; Study design and statistical modelling

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

A broad understanding of how humans modify ecological systems including impacts on animal populations, communities, ecosystems, and landscapes. Students will also gain an understanding of global change and how it may impact ecological systems.

Skills:

Present and discuss current issues of applied ecology.

General competence:

An in-depth understanding of the role of humans in ecosystem dynamics. Being familiar with key terms of conservation biology and natural resource management.

Innhold

Applying basic theory to the conservation and management of ecological systems. Students will gain additional exposure to reading and understanding scientific articles and scientific writing. The students will gain additional exposure to study design, data analysis and interpretation with a focus on applied ecology.

Arbeids- og undervisningsformer

Lectures, seminars, and computer exercises. Seminars will include presentations and discussions by student groups and outside speakers.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Portfolio including oral presentation and written reports

Eksamen

Written exam - 4 hours. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV322 Human dimension in ecosystem management

Emnekode: 6EV322

Studiepoeng: 7,5

Semester

Vår

Språk

English

Krav til forkunnskaper

he following courses of the master in applied ecology or equivalent courses from other universities: Concepts in ecology; Human impacts on ecological systems; Study design and statistical modelling

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

General concepts in Human Dimensions as values, attitudes, norms and behaviour. An understanding of different management systems, their ability to include interest groups and be adaptive through a formal or informal learning process. Basic principles of risk assessment and conflict resolution in natural resource management.

Skills:

Construct and analyse questionnaires including the use of Likert scales. When to use alternatives to questionnaires. Read and summarize scientific literature on natural resource management focusing on other disciplines than ecology.

General competence:

Be able to set up interdisciplinary groups to develop management strategies, and understand the most important pitfalls in such a process. Use knowledge of attitudes

and norms to be able to devise strategies for management implementation, and conflict avoidance. The potential use of information, communication and education to increase support for management decisions.

Innhold

Human values, attitudes and norms. The use and misuse of questionnaires, incl. the snowball method. Different management concepts, their pros and cons. Adaptive management, Threshold Management, Integrated management, Ecosystem management. Decision analysis, conflicts, winners and losers.

Arbeids- og undervisningsformer

Lectures, seminars, computer labs and excursions

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Minimum attendance at 2/3 of seminars + excursions.

Eksamen

One written report on the construction, data collection and analysis of a questionnaire. A final written exam with both shorter questions and an essay assignment. The report and the written exam will be weighed together. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV325 Topics in applied ecology

Emnekode: 6EV325

Studiepoeng: 7,5

Semester

Høst

Språk

English

Krav til forkunnskaper

The following courses of the master in applied ecology or equivalent courses from other universities: Concepts in ecology; Human impacts on ecological systems.

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

To gain updated knowledge with regard to current topics in applied ecology, and better understand what kind of scientific evaluations that can be used to describe a given article with regard to quality.

Skills:

Students will gain experience in presenting and criticising (and arguing in open debates) published literature in the field of applied ecology as if they were acting as referees in a scientific journal.

General competence:

The idea is that students should gain a better understanding of what measures one can use for evaluating scientific quality – both orally and written. Also, students will obtain competence in communication and participation in discussions related to scientific publications in relevant fields.

Innhold

Recent international publications in the following four topics of applied ecology: (i) The ecological effects of human impact in nature; (ii) The ecological effects of remedial actions; (iii) Sustainable utilisation of natural resources; and, (iv) Wildlife and habitat monitoring. (V)) Related and informative DNA methods.

Arbeids- og undervisningsformer

Seminars with students presenting, criticising and discussing scientific papers.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

- Be present on at least 80% of the seminars
- Presenting and functioning as a referee of one or more publications throughout the seminar series
- Active participation in discussion of papers presented by other students in the whole seminar series.

Eksamen

Oral exam

Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6SU399 Master thesis in applied ecology

Emnekode: 6SU399

Studiepoeng: 60

Semester

Vår

Språk

English

Krav til forkunnskaper

6EV310 Concepts in ecology, 6EV311 Study design and statistical modelling, 6EV320 Human impacts on ecological systems or similar before signing the contract for the master thesis with the supervisor

Læringsutbytte

An independent research project, where the student will plan, design and collect data from an empirical study connected to applied ecology, and analyse and present the results in the master thesis. The thesis will be in the form and structure of a manuscript intended to be submitted to an international scientific journal, but may be written in Norwegian.

Innhold

Optional English scientific literature accepted by the supervisor of the master thesis.

Arbeids- og undervisningsformer

Independent work by the student under the supervision of a professional in the field.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Oral presentation of the planned research project.

Eksamen

Written thesis with oral presentation and discussion. Grading according to ECTS-system on scale A – E for passed, and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV314 Population monitoring using radiotracking

Emnekode: 6EV314

Studiepoeng: 2,5

Semester

Vår

Språk

English

Krav til forkunnskaper

None

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge: The student knows the application, possibilities and limitations of the most commonly used radiotags and biosensors in wildlife research. The student is acquainted with the procedures and permissions used to apply radiotags to wildlife. The student knows the most important projections and coordinate systems. **Skills:** The student can apply triangulation in the field to track VHF-tags. The student is able to set up and organize databases to store location data. The student can visualize radiotracking and GPS-data in a geographical information system GIS and do simple movement and home range analyses. **General competence:** The student is aware of the animal welfare law applied to wildlife monitored with radiotags. The student has an insight into different tracking methods and the advantages and disadvantages of these methods. The student has some basic understanding spatial data and the use of GIS.

Innhold

Radiotracking techniques and applications, design of radiotelemetry studies, laws and permits needed, animal welfare, radiotelemetry in practice, triangulation, GPS use and GPS measurement errors, storage and management of spatial data in databases, visualization of radiotelemetry data in GIS, basic movement and home range analyses.

Arbeids- og undervisningsformer

Lectures, field tests, seminars

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Oral presentation

Eksamen

Written scientific report. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV314 Population monitoring using radiotracking

Emnekode: 6EV314

Studiepoeng: 2,5

Semester

Vår

Språk

English

Krav til forkunnskaper

None

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

The student knows the application, possibilities and limitations of the most commonly used radiotags and biosensors in wildlife research. The student is acquainted with the procedures and permissions used to apply radiotags to wildlife. The student knows the most important projections and coordinate systems.

Skills:

The student can apply triangulation in the field to track VHF-tags. The student is able to set up and organize databases to store location data. The student can visualize radiotracking and GPS-data in a geographical information system GIS and do simple movement and home range analyses.

General competence:

The student is aware of the animal welfare law applied to wildlife monitored with

radiotags. The student has an insight into different tracking methods and the advantages and disadvantages of these methods. The student has some basic understanding spatial data and the use of GIS.

Innhold

Radiotracking techniques and applications, design of radiotelemetry studies, laws and permits needed, animal welfare, radiotelemetry in practice, triangulation, GPS use and GPS measurement errors, storage and management of spatial data in databases, visualization of radiotelemetry data in GIS, basic movement and home range analyses.

Arbeids- og undervisningsformer

Lectures, field tests, seminars

Obligatoriske krav som må være godkjent før eksamen kan avlegges

- Oral presentation
- Report

Eksamen

Written scientific report. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV315 Chemical and physical capture of Scandinavian Mammals

Emnekode: 6EV315

Studiepoeng: 2,5

Semester

Vår
Blokk 4

Språk

English

Krav til forkunnskaper

None. Masters students will have priority for places in the course although open places can be filled by PhD students. Limited to 15 students.

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

- An advanced knowledge and understanding of the types of capture methods used for mammals of the world, with emphasis on Scandinavian species.
- Has thorough knowledge of the relevant physiology and pharmacology when capturing large mammals.
- Has thorough knowledge of the factors that must be considered for choosing capture methods, the legal aspects of capturing animals in Scandinavia, response to emergency situations and safety of field workers.

Skills:

- Can deal critically with various methods for choosing what type of capture methods to implement in common situations in Scandinavia.
- Ability to perform record-keeping and basic monitoring during anesthesia.
- Be able to analyze and critically discuss existing theories and dart-projecting systems and under which circumstances particular equipment is preferred.
- Ability to explain the course of action required for human exposure to capture drugs.
- Can carry out an independent limited research project under supervision with applicable norms for research ethics.

General competence:

- Acquire the ability to safely participate in captures, evaluate methods used and to discuss the advantages and disadvantages of different types of captures.
- Can analyze relevant academic professional and research ethical problems
- Can communicate extensive independent work on master language and terminology of chemical and physical capture of large mammals in Scandinavia.

Innhold

Physiology and pharmacology as relevant for wildlife captures, drugs used for wildlife capture, anesthesia monitoring techniques and dealing with common emergencies, principles of physical restraint, safety for capture personnel, important diseases and short and long term concerns related to capture.

Arbeids- og undervisningsformer

Lectures, seminars and exercises. Generally lectures will be in the morning, with practical sessions in the afternoon

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Practical exercises have required attendance (alternatives are possible if agreed on before the exercises). Some exercises may require attendance at the relevant lectures before participating.

Eksamen

- practical exercises

- individual written exam

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV316 Tropical wildlife - ecology, management and utilisation

Emnekode: 6EV316

Studiepoeng: 7,5

Semester

Vår

Språk

English

Krav til forkunnskaper

None

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge: The student knows and understands the most important principles and theories on the ecology of tropical mammals with different functional traits, their interactions with each other and with food resources and constraints, and how this knowledge can be used in management, mitigation of conflict and for sustainable consumptive and non-consumptive utilisation. **Skills:** The student is familiar with some basic methods of ecological studies of tropical wildlife. **General competence:** The student has a basic competence in using knowledge on ecology of tropical wildlife in management, mitigation of conflict and for sustainable consumptive and non-consumptive utilisation.

Innhold

Functional properties of tropical large mammals with emphasis on African species, general theories and hypotheses on the significance of such properties for wildlife

ecology and for management and utilisation of wildlife.

Arbeids- og undervisningsformer

Lectures and literature seminars at Evenstad; excursion to Tanzania with demonstrations of African wildlife ecology, management and utilization and with data collection for a personal “microproject”; after the excursion writing-up and presentation of the microprojects and a written exam.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Participation in literature seminars and in the excursion.

Eksamen

- Activities in literature seminars and during the excursion (20%)
- Project report (oral and written) (40%)
- Written exam (40%).

Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV321 Advanced statistical modelling

Emnekode: 6EV321

Studiepoeng: 2,5

Semester

Høst

Språk

English

Krav til forkunnskaper

The following course of the master in applied ecology or equivalent courses from other universities: Study design and statistical modelling

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

The student has a good understanding of advanced statistical modelling.

Skills:

The student can apply advanced statistical models in ecology and interpret model outcomes and predictions.

General competence:

The student is familiar with the use and limitations of statistics in ecology.

Innhold

GAM, Zero-truncated and Zero-inflated models, Mixed models.

Arbeids- og undervisningsformer

Lectures and practical exercises.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

One exercise

Eksamen

Individual report.

Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV323 Multivariate statistics in community ecology

Emnekode: 6EV323

Studiepoeng: 2,5

Semester

Høst

Språk

English

Krav til forkunnskaper

The following courses of the master in applied ecology or equivalent courses from other universities: Concepts in ecology; Study design and statistical modelling.

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

The student has knowledge on ordination and classification methods and their advantages and limitations in analysing different types of ecological data.

Skills:

The student has a basic knowledge on the application and interpretation of different ordinations (CANOCO) and classification (Twinspan) methods to ecological data.

General competence:

The student knows how to use ordination and classification for describing ecological communities and their relations to environmental predictors.

Innhold

Ordination techniques and related statistics using CANOCO, classification using

Twinspan.

Arbeids- og undervisningsformer

Lectures, self-selected literature studies and practise with CANOCO and with Twinspan; using the methods learned for writing a report on own or given data.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Participation in introductory lectures, presentation (oral and written) of a report.

Eksamen

Oral and written presentation of report. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV324 Analysis of spatial animal data

Emnekode: 6EV324

Studiepoeng: 2,5

Semester

Vår

Språk

English

Krav til forkunnskaper

The following courses of the master in applied ecology or equivalent courses from other universities: Population monitoring using radiotracking; Study design and statistical modelling

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

The student knows the applications and limitations of different home range estimators. The student understands the concept of habitat selection and resource selection modelling.

Skills:

The student can apply different home range estimators. The student can extract habitat information from GIS-maps and is able to do resource selection models.

General competence:

The student has a good understanding of spatial data and analyses. The student can apply mixed models in ecology. The student can work with advanced analyses in GIS.

Innhold

Different analyses methods of spatial point data in GIS and R: movement parameters,

home range analyses, resource selection models.

Arbeids- og undervisningsformer

Lectures, computer exercises

Obligatoriske krav som må være godkjent før eksamen kan avlegges

None

Eksamen

Written scientific report. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV327 Population monitoring using Capture Mark Recapture

Emnekode: 6EV327

Studiepoeng: 2,5

Semester

Vår

Språk

English

Krav til forkunnskaper

The following courses of the master in applied ecology or equivalent courses from other universities: Concepts in ecology; Study design and statistical modelling.

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

The student knows the applications and limitations of the monitoring method Capture Mark Recapture.

Skills:

The student can design and apply a monitoring study based on Capture Mark Recapture. The student is able to process collected data in the software MARK, and to interpret the results.

General competence:

The student has a good understanding of population monitoring.

Innhold

The course will give an introduction to different methods to estimate population

densities, survival and reproduction. It will focus on the method Capture Mark Recapture and introduce students to the software package MARK as well as similar solutions in R.

Arbeids- og undervisningsformer

Lectures, practical exercises.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Participation in the lab exercises

Eksamen

One written report. Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag

6EV328 Population monitoring using Distance sampling

Emnekode: 6EV328

Studiepoeng: 2,5

Semester

Vår

Språk

English

Krav til forkunnskaper

The following courses of the master in applied ecology or equivalent courses from other universities: Concepts in ecology; Study design and statistical modelling.

Læringsutbytte

A candidate with fulfilled qualifications will have the following learning outcome:

Knowledge:

The student knows the applications and limitations of the distance sampling method.

Skills:

The student can design and apply a monitoring study based on distance sampling. The student is able to process collected data in the software DISTANCE, and to interpret the results.

General competence:

The student has a good understanding of population monitoring.

Innhold

The course will start with an introduction to wildlife population assessment methods, and demonstration of how line and point transect methods is generalizations of sample

count methods (strip counts and point counts respectively). The underlying theory and assumptions of both line and point transect sampling will be covered, and the relative merits of the two approaches in different circumstances discussed. The course will contain one day with exercise in the field to collect data that then will be analysed during the start of the course. Good survey design is an essential ingredient of a successful survey so design issues and field methods will be covered in detail. More complex issues will be addressed after the introduction to distance sampling. Special methods are required to avoid size bias when animals occur in clusters and methods for adjusting for this bias will be given. Other parts of the course will cover how and when to use stratification to improve the precision of estimates when animal abundance, detection probability or clustering varies over time or space will be covered and how to incorporating covariates in detection function modelling.

Arbeids- og undervisningsformer

Class will be taught using lectures and discussion with and computer lab exercises involving analysis of actual and simulated datasets. One half day in the beginning of the course will be collecting data during an exercise in the field.

Obligatoriske krav som må være godkjent før eksamen kan avlegges

Two lab exercises and one written final report.

Eksamen

- Lab exercises (20%)
- Final report (80%)

Grading according to ECTS-system on scale A-E for passed and F for failed.

Ansvarlig avdeling

Avdeling for anvendt økologi og landbruksfag