Course report BIO301 Spring 2017, Current topics in Biodiversity, Ecology and Evolution

Course design

The learning outcomes, outline and overview of activities in this iteration of the BOI301 course is given in Appendix 1. The main goal of the course is to give students training in getting an overview of a relevant topic, and to review and present it to others. Also, training in writing a report/proposal/application and review process is essential.

Observations

10 students participated in the course, one A, seven B and two C's in the final grading scheme. The groups appeared to function well and students were motivated. The experiment with assigning the presenter just before the presentation worked well in terms of ensuring all took part in the group (see Student mid-term evaluation).

Given the products developed during the course, the presentations, applications, and reviews, we (the three teachers involved) are pleased with the achievement of the learning outcomes.

Student evaluations are generally positive (mid term and final evaluation) also to the group work. Points to follow up is group size and composition, time schedule, and feedback on each assessment element. For the latter part, we need to develop a more detailed and criteria-based feedback practice.

In conclusion, we think this format is quite good, and can continue in 2018 with only minor adjustments.

Appendix 1 – course outline and design

BIO 301 Spring 2017, Current topics in Biodiversity, Ecology and Evolution

In this course students learn how to find, interpret, present, and write about selected themes in ecological, evolutionary and biodiversity research. Themes can vary from year to year, and students work both individually and in groups to address questions, solve problems and develop recommendations. For each theme, students have to develop an overview of important papers, debates and research questions, and collaboratively report it back to the other students and/or develop a recommendation for policy or future research based on the scientific literature. Students will discuss and interpret research articles in the field, and conduct assignments including writing assignments, mini-literature reviews and exercises. A key component of the course will be the development of a small research proposal, an introduction or a literature review, which will be peer reviewed by other members of the group, and resubmitted in revised form.

After the course you should be able to:

1. Achieve an overview of ecological/evolutionary questions based on the scientific literature and databases
2. Critically reflect upon research methods, conclusions and statements in the discipline
3. Summarize and present advanced ecological/evolutionary themes
4. Develop, assess and give feedback on scientific texts, reviews or project proposals
5. Identify research needs and develop projects and applications

First meeting: 16th of January in room K1 at BIO, ground floor, A-building
Class meetings: see schedule below, and Mitt UiB, where information will be given
Teachers: Anders F Opdal (postdoc), Selina Våge (postdoc), Øyvind Fiksen (prof.)

Assessment: The course is inspired from Team Based Learning perspectives, where students work in groups parts of the time. Portfolio assessment, where all or selected elements of documented work (assignments, group projects, presentations etc) are included in the final assessment.

Required reading: As a part of the course, students search for and select relevant scientific literature on their own, using ISI Web of Knowledge or similar databases.

Learning outcomes and activities

- To be demonstrate abilities to **achieve an overview of ecological/evolutionary questions based on the scientific literature and databases** you need to
    - Select 3 themes or topics with your group, one from each teacher's list of alternatives
    - For each topic – search scientific databases. Develop an extensive list of relevant papers (10-20), and select a subset of key research papers, reviews or opinions (about 70 pages per topic). Justify the selected reading list with one sentence each. Explain and discuss the selection with teachers. Read papers and collaborate to establish your interpretation of the state-of-the-art, contemporary discussion themes, etc. and develop a presentation to for the class based on the selected literature.

- To be able to **Critically reflect upon research methods, conclusions and statements in the discipline:**

- Include critical reflections on current research approaches, methods and conclusions (for selected themes) in portfolio elements.

- **Summarize and present advanced ecological/evolutionary themes**
  - Presentations in class, write research proposal

- **Develop, assess and give feedback on scientific texts, reviews or project proposals**
  - Review proposals individually.

- **Identify research needs and develop projects and applications**
  - Write and review proposal, select some applications for funding with limited budget.

Workload: Each of the learning activities involve a certain number of hours of work. Remember, 260 hours is the standard workload for 10 ECTS. Summary of workload and assessment weight:

Learning activity	#	Time factor	Hours	Assessment
Contact meetings	10.0	2.0	20.0	
Reading selected papers	210.0	0.4	73.5	
Tutorials	3.0	2.0	6.0	
Search and select literature (group)	3.0	15.0	45.0	15.0%
Presentation of theme (group)	3.0	15.0	45.0	30.0%
Write proposal individually	1.0	45.0	45.0	30.0%
Review proposals (ind)	2.0	10.0	20.0	15.0%
Select proposals (group)	1.0	10.0	10.0	10.0%
In total			**265**	**100.0%**

Elements of assessment criteria (first part)

Literature selection: It is challenging to define exact evaluation criteria for the literature search and selection exercise, but we will be looking for some specific elements. You must agree on one long list of relevant papers (max 20) and from this list select papers constituting ca 70 pages in total, and justify your selection of each with one sentence. The selected papers should be (a mix of):

- important in defining the research in the field (citations, reviews)
- cutting edge research, representing state-of-the-art approaches
- pointing at the historical origin and development of the field
- balanced if there are controversies
- papers with strong scientific basis, powerful methods, clarity & elegance

Oral presentation of theme: Each group select three themes to present from the alternatives given by each teacher and according to the schedule in the table below. All participants in the group must be prepared to present on behalf of the group, and we draw two presenters from each group randomly each time (one for the first part and one for the second part). We will also find one day where those who are not present get a chance to present. In the presentations, we will be looking for:

- Scientific relevance to the questions asked
- A reflective and objective attitude, where statements and conclusions are firmly backed by references to observations and theory
- Ability to give an overview and summarize while at the same time point out the details in some selected papers

- Clarity of the presentation, that it can be understood and followed by the audience
- … to be discussed with the students.

Research proposal, review and evaluation: We will present and discuss the criteria for these elements later in the course.

Themes and schedule for Current topics in biodiversity, ecology and evolution

We propose some alternative themes from each teacher, and your group must select one from each.

1. Anders Opdal
    a. *Human induced evolution*. In 1859, when Charles Darwin presented his theory on evolution by natural selection, evolution was understood as a rather slow process typically requiring thousands to millions of years before materializing as visible adaptations or in speciation (i.e. the Galapagos fiches). However, to explain his theory, Darwin frequently used examples from pigeon breeding and the domestication of farm animals to illustrate how selection works. At the time it was well known that by selecting for certain desirable traits, one could over a few generations greatly magnify this trait in a population. For example as ornamentation on pigeons, or the amount of milk a diary cow could produce. In the wild, evolution would work similarly, but because selection is natural and not planed, it would be slow. What Darwin did not predict was the potential effect humans could have on the course of evolution, also in the wild – known as human induced evolution. What is this, and how can humans influence evolution? Do you see similarities to Darwin's breeding examples? Find a few examples of fields where human induced evolution is a major concern. What are the major challenges there? Often, human induced evolution is considered something we should avoid, but can there also be upsides?

    b. *The evolution of life histories*. Up until the mid 1900s, evolutionary theory was primarily focused on the natural selection for various physical traits, such as function, shape and size of various bodily structures like jaws, limbs, skin, eyes etc. However, apart from species having elaborate and diverse sets of body parts and functionality, evolutionary biologist came to appreciate that species also exhibit diverse and complex ways of living life (life histories), which again must also be subject to natural selection. Through literature searches, try to identify some key articles or books that addressed this new addition to evolutionary theory. In what ways does life history evolution broaden our view of evolution, and how does it connect to the previous views of evolutionary processes? Can the theory be used for any practical purposes?

2. Selina Våge
    a. *Antagonistic co-evolution - Arms-race dynamics between viruses and microbes.* Microbes dominate genetic and metabolic diversity in the biosphere. They are main-drivers of biogeochemical cycles and are essential for ecosystem functioning. A topical question in ecology and evolution is what drives and maintains microbial diversity. It is now recognized that viruses are important players not only for biogeochemical processes on ecological time-scales, but also for evolutionary diversification in their microbial hosts. In using relevant literature, explain how viruses influence the diversity of bacterial communities. Open research questions remain

concerning costs and benefits for hosts to defend themselves against viruses and for viruses to infect a range of different hosts, as well as what virus-host interaction networks look like. Based on data and theoretical studies presented in the scientific literature, determine whether there is any consensus regarding these open questions, and discuss potential contradictions.

b. *Mixotrophy - Break-down of animal - plant dichotomy*. Planktonic microorganisms are responsible for half of the global primary production and are thus important drivers of climate dynamics. Until relatively recently, plankton was typically treated as two main groups - autotrophic phytoplankton performing photosynthesis and heterotrophic zooplankton eating phyto- and other zooplankton. We now understand that a large fraction of all planktonic microorganism combine auto- and heterotrophic foraging modes and refer to these organisms as mixotrophs. The diversity of various foraging modes among mixotrophs is impressive, ranging from (macro-faunal and floral analogies of) green rabbits to cabbages eating meat. Provide an overview of the studies that have been made regarding marine mixotrophs in the last 2 decades. Based on scientific literature, what do you think affects the geographic distribution of various mixotrophic strategies? How will inclusion of mixotrophy affect predictions from marine ecosystem models?

3. Øyvind Fiksen
   a. *The impact of apex predators on ecosystems.* Top predators often have a strong impact on the structure of ecosystems, even if they represent a small biomass. Classical examples include wolves in terrestrial-, gadoids in marine- and piscivore fish in freshwater systems. Is there a general and accepted view of the role of apex predators in forming the structure and functioning of ecosystems? Choose one well studied example of how apex predators affects a particular ecosystem, and provide a detailed overview of the theory, methods and results using the scientific literature.

   b. *Evolution of cooperation*. The cooperation among non-related organisms has puzzled evolutionary biologists ever since Darwin, and in particular since the paper 'Evolution of cooperation' by Axelrod and Hamilton in 1981. Since then, concepts like tit-for-tat and iterated prisoners dilemma games have become valuable models in economics and other social sciences. Here, you should explain why cooperation is so difficult to understand in Darwinian terms and how Axelrod's ideas provided some answers. In addition, find and describe an example where the theory is useful to understand a non-human system. Why do you think this theory of cooperation seems more applicable to human systems? Or is it, really?

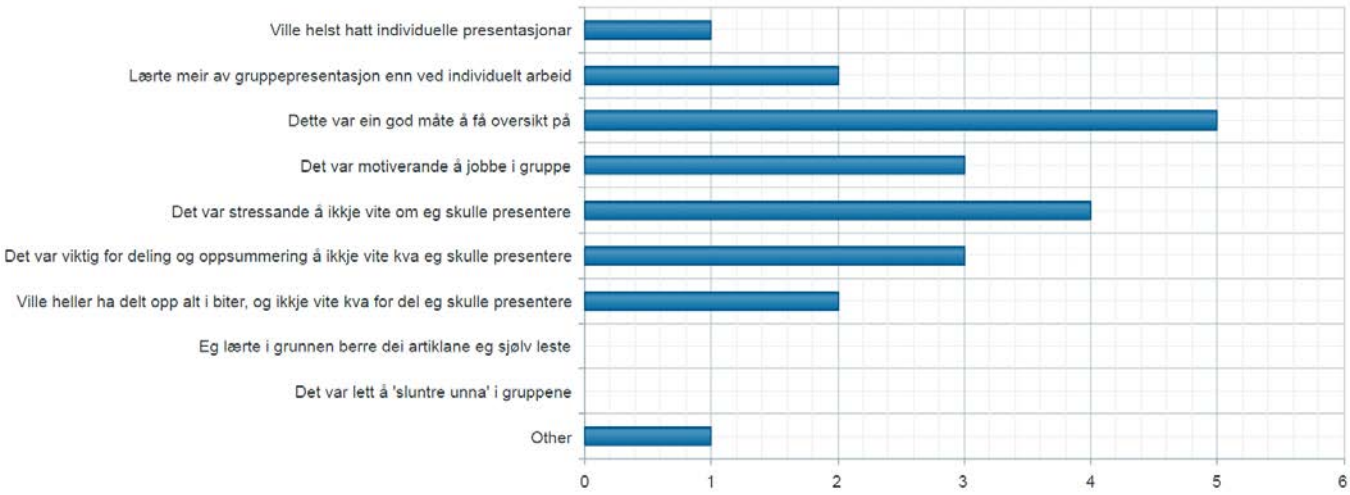
   c. *Ecological risk of GMOs?* Genetically modified organisms are valuable to human agriculture, the environment and food security, but remains highly controversial in many countries, such as in Norway. In this assignment, you should search the scientific literature and assess the ecological and environmental issues on the use of GM crops. Can you identify which controversies are present among scientists in the peer-reviewed literature? Present a few specific experiments, lab- or field studies, which have identified potential ecological risks associated with GMOs. As a group, do you think the benefits of GMO outweigh the risks? Based on your literature review, what would your recommendation be about the current restrictions on using GMOs in Norway?

Workplan BIO301 Spring 2017. Note that meetings are scheduled every second weeks

Date	Teachers	Learning activity and deadlines	Student work
M 16.01	AFO, SV, ØF	Introduction to the course. Establish teams. About working in teams. Presentation of possible themes by teachers	Start searching for relevant literature for each theme.
M 23.01	AFO, SV, ØF	Searching for research – how we do it. How to get an overview of a topic from the scientific literature	Discuss in groups – decide on 3 themes to focus on
W 25.01		Groups meet – teachers available to discuss	Develop literature list. Read papers.
F 27.01		Groups meet – teachers available	Develop literature list. Read papers.
M 06.02		Final reading list Theme 1 Anders Opdal Groups meet – teachers available	Submit literature Theme 1
W 08.02		Groups meet – teachers available	Prepare presentation
F 10.02	AFO, ØF	Present Theme 1	Presentations in class
M 20.02		Final reading list Theme 2 Selina Våge Groups meet – teachers available	Submit literature Theme 2
W 22.02		Groups meet – teachers available	
F 24.02	SV, ØF	Present Theme 2	Presentations in class
M 06.03		Final reading list Theme 3 Øyvind Fiksen Groups meet – teachers available	Submit literature Theme 3
W 08.03		Groups meet – teachers available	
F 10.03	ØF	Present Theme 3	Presentations in class
M 20.03	AFO, SV, ØF	Writing proposals, planning science	Lecture/Tutorial
W 22.03	AFO, SV, ØF	Writing proposals, planning science	Tutorials
F 21.04		Deadline submitting research proposal	
F 05.05		Deadline review of proposals	
W 10.05	AFO, SV, ØF	Board meeting: shortlisted proposals. Justification of selection	Groups present their decisions on funding to research proposals

Appendix 2: Mid-term evaluation March, after all group presentations.

Specific questions, this link: https://skjemaker.app.uib.no/report.php?key=3246591xb48905c40e



Generelle kommentarar om denne delen av kurset?
Hovedproblemet dette halvåret er tid, og det oppleves derfor kanskje enda mer stressende å ha uforitsigbare møter/framføringer enn andre halvår. De fleste tar ulike fag og har ulike timeplaner, noe som gjør samarbeidet mer utfordrende (vi brukte de oppsatte tidspunktene, men hadde behov for enda mer tid sammen. Tror en idè til neste år er at en setter av enda mer tid, slik at det ikke kan overlappe med andre fag). Det var fint at tidspunktet en fikk vite hvem som framførte ble flyttet til 12.00. Jeg kunne framføre hva som helst av presentasjonen, men det er godt å ha 2 ganger ekstra gjennomgang av sin del for å finpusse litt på det en vil si før framføring. Det gjør at en kan frigjøre seg enda mer fra rekkefølge/notater. Gruppen fungerte flott sammen generelt! Synes også at alle oppgaver vi kunne velge mellom var gode og interessante, og kjekt at det var rom for å velge litt innenfor oppgavene hva en kunne fokusere på.
Synes det var greit for det meste. Bra at man ikke vet hvem som skal presentere, det er eneste måten å få alle til å lære seg alt. Synes ikke det er nødvendig at flere enn to presenterer, hadde vært frustrerende å bare si noen få ting. Gruppepresentasjon er utfordrende da man ikke alltid er enig om hva som skal vektlegges og hvordan presentasjonen skal utformes, men slik vil det alltid være.
Vi brukte veldig mye tid på dette, vi lærte en del også, og det er bra, men føler at siden det var innlevering hver uke og gruppearbeid var det vanskelig å prioritere andre fag i tillegg i denne perioden siden vi ikke vil skuffe andre i gruppen. Det var også veldig stressende de siste dagene før presentasjonen siden vi ikke visste hvem som skulle presentere. Gruppearbeidet fungerte ellers bra, men det tar som regel mer tid med gruppearbeid siden man da må finne tider hvor alle kan møtes (vi møttes 3 ganger i uka og hadde i tillegg mye kontakt på en facebook-gruppe). Vi fant ut at det fungerte mye bedre å jobbe sammen når vi møttes enn online, derfor prøvde vi å møtes så ofte som mulig, men var til tider vanskelig at alle hadde fri samtidig siden alle har forskjellige fag. Hadde på den måten kanskje vært greiere om gruppene var delt inn (så godt det lar seg gjøre) i de som har noen av de samme fagene feks. Ellers har jeg likt faget så langt, men som sagt litt mye å gjøre (noe som har ført til at vi har ligget bak i andre fag i denne perioden).

Gruppearbeid gjorde at jeg lærte mye på kort tid.

Appendix 3. Evaluation at the end

Det som var bra...	**..og det vi kan endre eller andre forslag**
Jeg likte spesielt godt prosjektsøknadskrivingen. Det er en type oppgave jeg aldri har prøvd meg på før, og det var veldig lærerikt å få prøvd da dette er noe som kan være nyttig senere i arbeidslivet.	
Jeg likte - Valgmulighetene ved hvert tema. - Måten faget var lagt opp på med lite tradisjonell undervisning, mye diskusjon og egenstudier. - Mappevurdering i stedet for eksamen. - At vi fikk vurdere andres arbeid, og selv motta vurderinger fra både medelever og undervisere	Før presentasjon 1 hadde vi ganske god tid, mens de neste presentasjonene kom ganske tett. Dette gikk greit, men jeg hadde satt pris på et bittelitt mer tid. Det hadde også vært greit med et eksempel på en prosjektsøknad i forkant av oppgaven, slik at man forsto litt bedre hva som forventes. Vi fikk jo en mal, og det var fint, men den kunne tolkes veldig forskjellig (som vi så da vi gikk gjennom hverandre sine oppgaver).
Synes emnet var bra, så fant ikke et alternativ som passet. (Second option og first option?) Jeg likte at vi fikk fordype oss i et emne, og at vi hadde flere valgmuligheter blant emnene. Det var lærerikt å få skrive prosjektsøknad, det har jeg ikke gjort før. Bra opplegg med gruppene, selv om det kan være vanskelig å vurdere alle i en gruppe. Jeg likte at alle måtte være forberedt, og to blir trukket rett før.	Skulle ønske vi fikk vurderinger underveis og tilbakemelding på presentasjonene. Og gjerne en egen vurdering på prosjektsøknaden. Nå vet jeg ikke hva karakteren er basert på (hva som trakk meg opp og ned), eller hvor bra jeg gjorde det på presentasjonene, søknaden og kommentarene. Hvis vi hadde fått tilbakemelding etter første presentasjon, kunne vi gjort det bedre neste gang. Vi kunne gjerne vært delt i litt mindre grupper slik at hver og én må bidra mer, mindre uenigheter og kanskje lettere å vurdere. Synes denne klassen kunne blitt delt i tre.