

Course title: Polar Biology

Semester: FA17

Credits: 3

Location: Copenhagen

Core Class: yes

Study Tour: Tromsø

Major Disciplines: Biology, Environmental Science, Sustainability

Faculty Member: Astrid M. Z. Bonde

Description of course: In this course we will provide you with an understanding and introduction to the biology of the Polar regions with a special emphasis on the northern hemisphere. You will further obtain knowledge about how organisms of the Polar regions are evolutionary adapted to cold terrestrial or marine environments with strong seasonality. You will gain insight into population dynamics and species richness of the Arctic regions in northern Scandinavia and Greenland through case studies. You will also obtain first hand experience on how migrating polar species rely on ecosystems in Denmark when they embark on their long journeys.

The course will also focus on how climate change, pollution and exploitation are affecting the ecosystems. Field studies will focus on ongoing research in the area of Tromsø, Norway where both terrestrial and marine Arctic research is well established. Species of interest will be seals, whales, polar bears, salmon, cod, willow, Dryas and lichens. In particular, we will look at ecological dynamics as glacier – plant dynamics and studying how herbivore dynamics are affected by climate changes.

Learning objectives of the course: By the end of this course you will be able to communicate and understand theories and analyses of Arctic ecology within population dynamics, life history theory, species interactions and evolutionary adaptations as well as behavioural ecology. The Arctic species groups the course will focus on are birds, mammals, vascular plants and invertebrates. You will gain insight into how arctic flora and fauna have evolved and developed through time and how it is being affected by climate change. Students will understand how human activities have and will influence ecological life cycles and dynamics. Moreover, the students will be able to present, read and discuss scientific literature on challenges and possibilities for the Arctic marine and terrestrial ecosystems within a changing climate.

Topics will often be examined through local, regional and global perspectives. Denmark provides a good base for this as it holds many Arctic resources in Greenland. Denmark is also a member of the EU whereas certain Northern countries (i.e. Norway and Iceland) are not. Thus the course will also consider if policy as such is important from a conservation and management perspective.

You will get to know some of the Arctic nature through field excursions.

The course is divided into the below modules:

1. Introduction to the polar regions
2. Stress, adaptation, and survival in polar regions

This syllabus is subject to change.

3. Periglacial and terrestrial habitats in polar regions
4. Glacial habitats
5. Inland waters and open oceans in polar regions
6. Frozen oceans
7. Birds and mammals in polar regions
8. Climate change in polar regions
9. Human impact on polar regions
10. Conservation and wildlife management in polar regions
11. Community based monitoring and traditional knowledge in polar regions
12. Some conclusions

Required texts: The primary readings will be from *The Biology of Polar Regions*. D.N. Thomas, G.E. Fogg, P. Convey, C.H. Fritsen, J.-M. Gili, R. Gradinger, J. Laybourn-Parry, K. Reid, and D.W.H. Walton. Second Edition. Published to Oxford Scholarship 2008. Other readings will be made available online

Approach to Teaching: The course will involve lectures, class discussion, group work, role game, field studies and student projects. Furthermore, there will often be questions presented for you to consider, discuss, and present in small groups.

All students are expected to have completed the course readings *before* class, so we can discuss the material at the right level. It is important to be well prepared for class as I may randomly select students to give key points on the readings for that day.

The lectures will be taught in the order written in the syllabus, unless you are told differently. The order of the lectures is to ensure that you know all of the basic concepts before we go into deeper discussions of more conservation-related issues in today's society.

Field studies, practicum and/or study tour:

Core Course Week and Study Tours

Core course week and study tours are an integrated part of the core course as we take the classroom out into the field and see how theory is translated into practice.

Core Course Week:

Date: To be announced

Short Study Tour to Western Jutland

This three-day short tour will take you to Western Denmark to see how Polar bird species are passing through Denmark on their migration route to or from the Arctic (depending on spring or fall semester). You will explore the Wadden Sea area both environmentally and culturally. You will also be experiencing the former glaciated area in North Zealand to learn about how the last glacial maximum affected the environment and left the traces we observe in the landscape today.

- Visit the Wadden Sea National Park to study the Polar migrating birds to/from their feeding and breeding grounds as well as the local unique biodiversity

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- “Sea hike” into the the Wadden sea to visit the oyster banks and witness the great shifts in tide and how species adapt to such an ecosystem
- Visit the whale museum in Gram (Sønderjylland museum) to investigate how whale species have adapted to different climate niches and extinction events.

The Danish field studies will be visiting previous glaciated landscapes in Zealand on our way to West Jylland and look for fossil remains from the previous glacial period. You will be spotting for polar migrating birds on their migratory route to winter/summer habitats and we will be learning about the local flora and fauna as well immerse into the culture through different cultural experiences and cuisine.

Long Study Tour to Tromsø, Northern Norway

During the week-long stay in and around Tromsø in Northern Norway you get a hands-on and very close encounter with the Arctic climate and see magnificent wildlife as well as experience how a modern Arctic society is living. Activities will involve hiking and kayaking or sailing around the fjord areas as well as visiting local research institutions where experts will tell us about ongoing research on Arctic biodiversity.

You will also get to stay in a Sami style tent and learn how the local Sami lifestyle is dependent on reindeer herding and their challenges from reduced areas for them to feed.

During our field trips we will study local plant-glacier dynamics, adaptations of different plant, mammal and bird groups of the area.

TBA: Schedule of classes, readings to be done for each class, and assignment due dates.

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