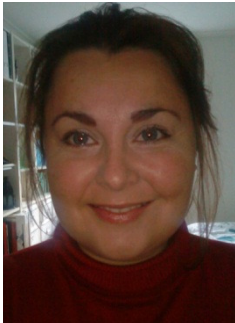


**Biology of Marine Mammals**  
**Tuesdays and Fridays: 8:30-9:50**  
**Location: 10-A33**



**Maria Iversen**

Cand. Scient. in Biology (University of Århus, 2004). Focus on marine mammal biology, population ecology, physiology, behaviour and conservation. Research assistant at the Danish Institute for Fisheries in the field of harbour porpoises and other Danish small cetaceans (2002) plus several other international projects and courses. Researcher in several projects concerning marine mammals both in Denmark, Scotland, Greenland and Iceland since 1999. PhD. studies in Spain, Iceland and Norway. With DIS since January 2005.

**DIS Contacts:**

Program Director: Anette Birck, DIS Vestergade 7.38, +45 3376 5485

Program Assistant: Stephanie Clemente, DIS Vestergade 7.37, +45 3376 5477

**Course Content:**

The coastal and off-shore waters of the Danish Kingdom (Denmark, Greenland and the Faeroe Islands) are home to some of the world's largest populations of marine mammals: whales, seals, dolphins, porpoises, etc. All Nordic countries have long traditions of conservational and basic biological research of marine mammals, though they also have a long history of exploiting these stocks. This course aims to introduce you to marine mammals and provide you with a general overall knowledge about marine mammals. The course will be divided into three main parts:

- Part 1:** *Introduction to Marine Mammals* – anatomy, distribution and lifestyle as well as classification plus 9 special examples of animals.
- Part 2:** *Physiological Adaptations of Marine Mammals*: locomotion, thermoregulation, diving, food, feeding, growth, energetics, reproduction, social organization, behavior, sound and communication.
- Part 3:** *Marine Mammals on Population Level*: population structure and parameters, conservation, hunting, whaling, fisheries interactions and conservation.

**Learning Objectives:**

Biology of Marine Mammals is an introduction to marine mammals. By the end of this course you will be able to compare the different taxa of marine mammals. You will also learn the main physiological and morphological differences between the taxa. You will know at least one animal from each taxa and be able to compare these with each other in a number of aspects, such as reproductive and feeding strategies. Some focus will be on the marine mammals and research in Denmark and a number of prominent researchers within their field of expertise will give guest lectures or teach you on fieldtrips.

During the course you will learn that not everything has yet been fully investigated and that some questions remain unanswered. History also plays a role in marine mammal science, which in the forms of evolution, hunting and technology (e.g. tags), can help us better understand these animals. Another interesting subject is ethics - we do not learn about this directly, but it is important, e.g. conservation issues. The course is built throughout the semester – you will learn the basics first – so you understand the main taxa before discussing it or a problem related to the animal. Also you should be able to relate your

## *DIS Spring 2012, Biology Of Marine Mammals*

knowledge to a broader picture and discuss problems related to marine mammal populations today after this course.

### **Required texts**

Biology of Marine Mammals, eds. J.E. Reynolds, III and S.A. Rommel, vol 1, Smithsonian Institution Press, Washington D.C., 1999

Marine Mammals: Evolutionary Biology by Annalisa Berta and James L. Sumich, Academic Press, 1999

Course Compendium

*\*In the evolutionary book pay more attention to names, families and features that apply to the now living animals and not so much on evolutionary contents. However, focus on when marine mammal groups evolved and who their ancestors were.*

*\*\* Don't pay too much attention to formulas and equations, it's important to know the meaning behind it, not the mathematics*

### **Approach to teaching**

Most classes will be structured as PowerPoint lectures, with questions for you to consider and discuss 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.

For every subject, there will be a PowerPoint posted on the course Forum site. This can be accessed during the lecture, or printed off ahead of time for note taking. In addition, you can find notes for each lecture online, and you will have some study questions for each topic. Some lectures will be taught over several class periods, and if we do not finish a lecture one day, you can expect that we will continue with it the next time (unless I tell you differently).

You should always read for the day listed in the syllabus, even if we are continuing on from the previous class. It is important to be prepared because I may randomly pick 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.

Taxonomy can seem tedious at times, but it is really important for all of the subjects that we discuss, so you will see me emphasize it again and again.

I prefer for students to come and talk with me directly if they have problems with the course material, my teaching style, etc. I know that this may be somewhat different than what you are used to, but please give me the chance to learn along with you. I expect a lot from you, but I also will give you all of the tools that you need to meet my expectations. I may give pop quizzes, but most of the time you will be well warned and know what to study for the tests.

### **Prerequisites**

At least one year of biology at the university level

### Expectations

#### In general:

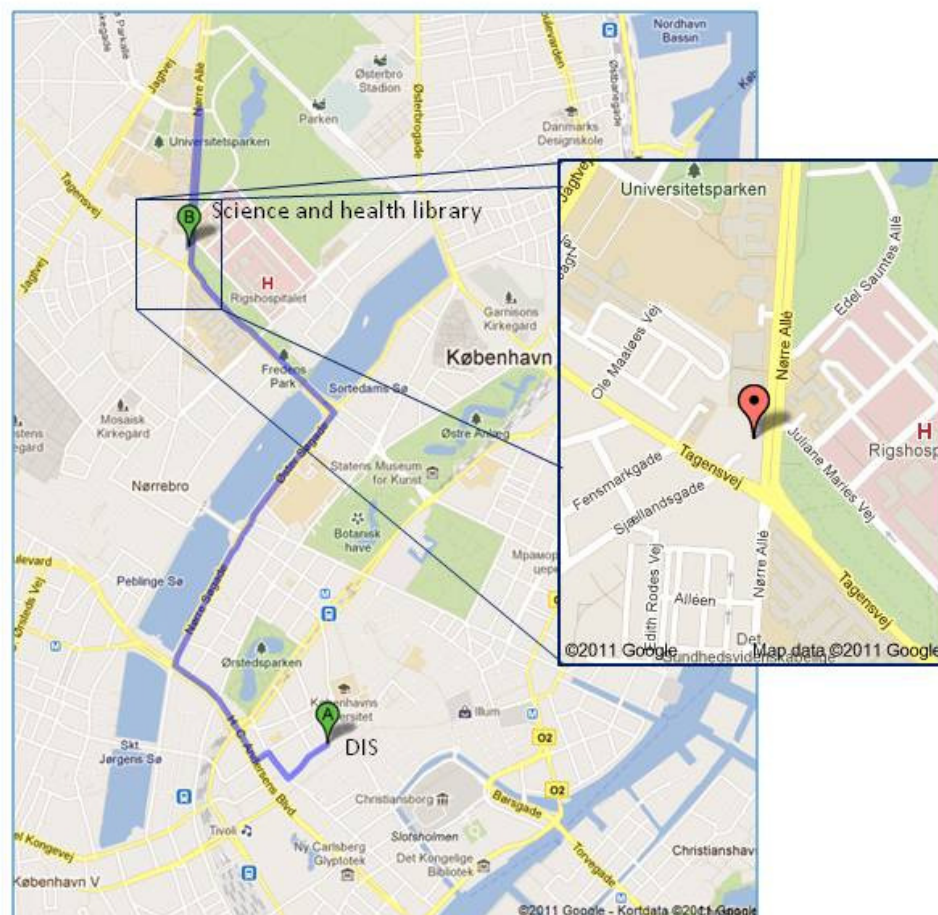
- Critically read the assigned readings *before* class with the help of handouts and questions for the given lecture also in days with tests
- Laptop use is limited to PowerPoint or a document for taking notes. If you are on Facebook, Instant Messaging, etc, your participation grade will severely suffer. Occasionally, I will ask you to search for something, and in these cases internet searches are allowed.
- Mobile phones are not allowed during class
- Pay attention to the 'sum ups' during lectures, the questions and the handouts.
- Hand in your papers and assignments on time, otherwise your grade will be penalized by a half a grade pr day of delay
- You should be able to search for and find scientific references on you own using the science library of Copenhagen

Address: Library of Natural and Health Sciences

Nørre Allé 49, 2200 København N

Tlf. 3347 5177

Mon-Thurs: 8-21. Friday: 8-18. Sat-Sun: 10-17



- Talk to me directly, the class rep, or Stephanie Clemente, if there are any problems.

### Term Paper

1. 6 to 8 pages in length
2. Outline with title and 10 references
3. Further guidelines on Forum

### Participation Covers the Following Areas:

1. Attendance
2. Level of preparation and ability to answer questions asked in class
3. Involvement in class and group discussions
4. Active participation in field studies and visits during study tours
5. Level of individual research and contribution to discussions
6. Being on time and handing in papers and assignments on time
7. Asking questions when you don't understand a subject or when you want further explanation of a subject
8. Completion of reading assignments

Participation is evaluated after each class/field study and used to calculate the final participation at the end of the semester. Good participation equals a grade of A to B+, average participation equals a grade of B to B-, low participation equals a grade C+ or below.

### Short Answer Tests

1. Two throughout semester
2. Approximately 30 minutes in length
3. Use them to gauge how you are doing in the class
4. 5 % of every test will be from the readings – not necessarily talked about in class

### Final

1. Two hour long exam
2. Cumulative
3. Administered by a DIS proctor during finals week, instructor will not be present

### What I expect you to know before the exams?

- Knowledge about keywords and names of groups and families
- Knowledge about the general structure and things in regards to ecology, physiology, behavior, reproduction, life history, history etc. (located in your readings and will be discussed in class)
- Be able to put any subject in context of the surrounding environment, specifically European waters, and politics.
- Ask questions if there is something you do not understand

### Course Evaluations

Term paper	20 %
Tests (2 x 15 %)	30 %
Final	30 %
Participation	20 %

## **DIS Policies**

### **Attendance**

You are expected to attend all DIS classes when scheduled. If you miss multiple classes the Director of Teaching and Learning, and the Director of Student Affairs will be notified and they will follow-up with you to make sure that all is well. Absences will jeopardize your grade and your standing at DIS. Allowances will be made in cases of illness, but in the case of multiple absences you will need to provide a doctor's note.

### **Academic Honesty:**

Plagiarism and Violating the Rules of an Assignment

DIS expects that students abide by the highest standards of intellectual honesty in all academic work. DIS assumes that all students do their own work and credit all work or thought taken from others. Academic dishonesty will result in a final course grade of "F" and can result in dismissal. The students' home universities will be notified. DIS reserves the right to request that written student assignments be turned in electronic form for submission to plagiarism detection software. See the *Academic Handbook* for more information, or ask your instructor if you have questions.

**Disability and resource statement:** Any student who has a need for accommodation based on the impact of a disability should contact Sean Green to coordinate this. In order to receive accommodations, students should inform the instructor of approved DIS accommodations within the first two weeks of classes.

### **Deadlines for assignments**

**16 March: Outline for Term paper (hard copy) on my desk at the beginning of class**

**27 April: Term Paper (hard copy + digital) on my desk at the beginning of class**

**Test 1: Friday 17 February: lectures 1-5**

(Introduction to the course & Marine Mammals; Pinnipeds, Cetaceans, Sirenians and Fissipeds - Anatomy, Distribution and Lifestyle)

**Test 2: Friday 23 March: lectures 6-13**

(Locomotion, Thermoregulation, Diving Physiology & Anatomy, Sound & communication, Reproduction and Reproductive Strategies, part of health)

### **Field Studies**

#### **Wednesday, 22<sup>nd</sup> of February, Zoological Museum**

Visit to the Zoological Museum in Copenhagen. The visit to the zoological museum will include a walk through the exhibitions and the museum's large scientific collection of whalebones.

**Meeting Point:** Nørreport Station between the 2 KIOSKS

Meeting time: 13:00

End of event: 17:00

#### **Saturday, 24 March, Odense Zoo and Fjord & Belt Center**

**\*Please bring your own lunch & drinks as well as appropriate clothes\***

## *DIS Spring 2012, Biology Of Marine Mammals*

A behind the scenes look at the reasons for specialized research and behavior training with animals in human care. Species on display: live porpoises including a young calf, seals, manatees also with a young calf, sea lions, etc.

**Meeting time/point:** 07:45 - Frue Plads (next to Our Lady Church)

End of event: 17:00 – depart by bus back to Copenhagen

Estimated return to Cph. 19:00

### **Course Schedule**

*Schedule is subject to change if necessary with as much notice as possible*

### **Part 1: Introduction to Marine Mammals**

#### **Friday 27 January**

**8:30 – 9:50 DIS 10-A33**

##### **Lecture 1 - Introduction to Marine Mammals**

Review of systematics of the seals, whales, sea cows, sea otters and polar bears from the viewpoint of evolutionary taxonomy and phylogeny

##### **Readings:**

*Biology of Marine Mammals. Chapter 1: pp. 1-14 (good introduction)*

*Marine Mammals: Evolutionary biology, Chapter 2 pg. 12- 17 & 22-23.*

Evans, Peter and Juan Antonio Raga (2001): 'Systematic List of Marine Mammals' In:

*Marine Mammals. Biology and Conservation. (good reference) (Reader Compendium #1)*

#### **Tuesday 31 January**

**8:30 – 9:50 DIS 10-A33**

##### **Lecture 2 - Introduction to Marine Mammals**

Review of systematics of the seals, whales, sea cows, sea otters and polar bears from the viewpoint of evolutionary taxonomy and phylogeny

##### **Readings:**

Thewissen *et al.* (2009): From land to water: the Origin of Whales, dolphins and porpoises. *(Reader Compendium #2)*

Arnason *et al.* (2006): Pinniped phylogeny and a new hypothesis for their origin and dispersal. *(Reader Compendium #3)*

*What to take home from these articles: The now-living animals, the main lines of origin & why, their relation to now-living animals and to terrestrial animals*

#### **Friday 3 February \*\*Elect Class Representatives\*\***

**8:30 – 9:50 DIS 10-A33**

##### **Lecture 3 - Pinnipeds - Anatomy, Distribution and Lifestyle**

Natural history of true and eared seals, sea lions and walruses. An overview of the Order. Specific examples of a few species.

##### **Readings:**

Riedman (1990): The Pinnipeds: Seals, sea lions and walruses: 50-83 *(Reader Compendium #4)*

**Pinniped handout on Forum** – make notes to bring to class on the Caribbean monk seal, Walrus, Northern Elephant seal, Antarctic fur seal, harbour and Grey seal

**Further Optional Reading:**

*Marine Mammal –Evolutionary Biology, Chapter 3: pp. 24-46; Chapter 6: pp. 122-124 (6.51)*

**Tuesday 7 February**

**8:30-9:50 DIS 10-A33**

**Lecture 4 - Cetaceans - Anatomy, Distribution and Lifestyle**

Natural history of toothed and baleen whales. An overview of the order. Special examples of a few species.

**Readings:**

Evans (1997):The natural history of whales and dolphins:206-248 (*Reader Compendium #5*).

**Cetacean handout on Forum – make notes to bring to class on the Harbour Porpoise, Fin whale and Sperm whale.**

**Further Optional Reading:**

*Marine Mammal –Evolutionary Biology, Chapter 4: 4.1, 4.2.1 & pp. 60-80 (Focus on living groups); Chapter 6: pp. 124-125 (6.5.2)*

**Friday 10 February**

**DENMARK SHORT STUDY TOUR NO CLASS**

**Tuesday 14 February**

**8:30-9:50 DIS 10-A33**

**Lecture 5 - Sirenians and Fissipeds - Anatomy, Distribution and Lifestyle**

Natural history of manatees, dugongs, sea otters and polar bears. Special example of one manatee, the sea otter and the polar bear

**Readings:**

*Marine Mammal –Evolutionary Biology: Chapter 5: pp. 89-105; Chapter 6: pp. 126-127 (6.5.3).*

**Handout on Sirenians and Fissipeds on Forum – make notes to bring to class on the Polar Bear, Marine and Sea Otter, Dugong and West Indian Manatee**

**Part 2: Physiological Adaptations of Marine Mammals**

**Friday 17 February**

**8:30 – 9:50 DIS 10-A33 **\*\*Test # 1 covering Lectures 1 – 5\*\*****

**Lecture 6 - Locomotion in Marine Mammals**

A morphological approach to method and efficiency of locomotion, covering the diverse adaptations of the different marine mammal species.

**Readings:**

*Biology of Marine Mammals, Chapter 2: pp. 27-31 (locomotion)*

*Marine Mammals –Evolutionary Biology: Chapter 8 various sections.*

*Pinnipeds: pg. 169-77 + figure 8.3*

*Cetaceans: from section 3 at pg. 185 to 193 minus 8.3.5 & 8.3.6.2.*

*Sirenians: 196-199 (start at section 8.4.4)*

*Fissipeds: 202-203 (start at section 8.5.6)*

**Tuesday 21 February**

**8:30 – 9:50 DIS 10-A33**

**Lecture 7 - Physiology of Thermoregulation**

Heat conservation and dissipation – how marine mammals maintain a stable core temperature in a watery environment.

**Readings:**

- Scholander & Schevill (1955): Counter-current vascular heat exchange in the fins of whales. *J. Appl. Physiol.* 8(3): 279-282. (*Reader Compendium #6*)
- Rommel et al. (1998): Reproductive thermoregulation in Marine Mammals. *American Scientist* 86: 440-448. (*Reader Compendium #7*)
- Abstract only: Heyning, J. E. (2001): Thermoregulation in feeding baleen whales: Morphological and physiological evidence. *Aquatic Mammals* 27(3): 284–288. (*Reader Compendium #8*)

**Wednesday, 22 of February,**

**Zoological Museum**

Visit to the Zoological Museum in Copenhagen. The visit to the zoological museum will include a walk through the exhibitions and the museum's large scientific collection of whalebones.

**Meeting Point:** Nørreport Station between the 2 banks, Nordea and Danske Bank

Meeting time: 13:00

End of event: 17:00

**Friday 24 February**

**8:30 – 9:50 DIS 10-A33**

**Lecture 8 - Diving Physiology and Anatomy**

Special adaptations to resist pressure at depth; ways to conserve energy – bradycardia, increased oxygen storage, circulatory changes and anaerobic respiration – and prolong dive time; special example of the sperm whale.

**Readings:**

- Kooyman (2006): Mysteries of adaptation to hypoxia and pressure in marine mammals. (*Reader Compendium #9*)

**Tuesday 28 February**

**8:30 – 9:50 DIS 10-A33**

**Lecture 9:** Sum up's over the last lectures and introduction to the term paper incl. choice of subject.

**Readings:** Hand-outs on forum and chapter on term paper on Forum.

**Friday 2 March**

**8:30-9:50 DIS 10-A33**

**Lecture 10 - Marine Mammal Sound and Communication**

Vocalization, echolocation and hearing.

Guest Lecture Prof. Lee Miller, SDU Odense

**Readings:** Tyack, P.L. & Miller, E.H. (2002): Vocal anatomy, acoustic communication and echolocation, Chapter 6 in *Marine Mammal biology – in an evolutionary approach*. Ed. Rus-Hoelzel, A. Blackwell Science: 142-174. (*On forum*)

**March 3-11:**

**LONG STUDY TOUR- NO CLASSES**

**Next week: individual meetings with Maria** – make sure to sign up before Monday!

**Tuesday 13 March**

**8:30 – 9:50 DIS 10-A33**

**Lecture 11 – Food and Feeding Strategies**

How marine mammals detect and catch prey; morphological adaptations to optimize capture of prey as diverse as plankton, fish and squid; how lifestyle has adapted to seasonal prey availability e.g. migration in large baleen whales.

**Readings:**

Croll et al. (2008): Filter feeding. In Encyclopedia of Marine Mammals eds. Perrin, W., Würsig, B. & Thewissen, J.: 421-425. (*Reader Compendium #10*)

Dehn et al.(2007): Feeding ecology of phocid seals and some walrus in the Alaskan and Canadian Arctic as determined by stomach contents and stable isotope analysis. *Polar Biol* 30:167–181. (*Reader Compendium #11*)

Abstract only: Ford & Reeves (2008): Fight or flight: antipredator strategies of baleen whales. *Mammal Review* 38 (1): 50–86. (*Reader Compendium #12*)

**Friday 16 March**

**8:30 – 9:50 DIS 10-A33\*\* *Hand in outline for term paper + make sure to sign up for individual meetings\*\****

**Lecture 12 - Reproduction and Reproductive Strategies**

The reproductive cycle and behaviour of different marine mammals, with discussion and explanation of oestrus, delayed implantation, birth, lactation and reproductive senescence.

**Readings:**

Evans & Stirling (2001): 'Life History Strategies Marine Mammals' In: *Marine Mammals. Biology and Conservation*. New York: Kluwer Academic/Plenum Publishers. pp. 7-47 (*Reader Compendium #13*)

**\*\*Week of individual meetings with Maria\*\*** (remember to book time before Monday)

**Tuesday 20 March**

**8:30 – 9:50 DIS 10-A33**

**Lecture 13 – Rest Reproduction and Health**

**– rest of reproduction lecture and Marine Mammal Health**

**Marine Mammal Health**

Coverage of pathogens, parasites and mass mortalities; environmental effects from pollution to global warming on the food resource and habitat, and hence the health and reproduction of marine mammals.

**Readings:**

Geracci & Lounsbury (2001): Marine Mammal Health: Holding the Balance in an Ever-changing Sea. In: *Marine Mammals. Biology and Conservation.*: 365-378. (*Reader Compendium #14*)

**Friday 23 March**

**8:30 – 9:50 DIS 10-A33 **\*\*Test #2 covering Lectures 6 – 13\*\*****

**Lecture 14- Marine Mammal Health**

Coverage of pathogens, parasites and mass mortalities; environmental effects from pollution to global warming on the food resource and habitat, and hence the health and reproduction of marine mammals.

**Readings:**

Abstract only: Pierce *et al.* (2008): Bioaccumulation of persistent organic pollutants in female common dolphins (*Delphinus delphis*) and harbour porpoises (*Phocoena phocoena*) from western European seas: Geographical trends, causal factors and effects on reproduction and mortality. (*Reader Compendium #15*)

Abstract only: Fernandez *et al.* (2005): "Gas and Fat Embolic Syndrome" Involving a Mass Stranding of Beaked Whales (Family *Ziphiidae*) Exposed to Anthropogenic Sonar Signals (*Reader Compendium #16*)

**Saturday 24 March**

**Odense Zoo and Fjord & Belt Center**

**\*Please bring your own lunch & drinks as well as appropriate clothes\***

A behind the scenes look at the reasons for specialized research and behavior training with animals in human care. Species on display: live porpoises including a young calf, seals, manatees also with a young calf, sea lions, etc.

**Meeting time/point:** 07:45 - Frue Plads (next to Our Lady Church)

End of event: 17:00 – depart by bus back to Copenhagen

Estimated return to Cph. 19:00

**Tuesday 27 March**

**8:30 – 9:50 DIS 10-A33**

**Lecture 15- Social Organization and Behavior in Marine Mammals**

Monogamy, polygyny and matriarchy – what do they mean in marine mammal societies? How well do marine mammals look after their young? How do schools of dolphin co-operate in feeding? and protect each other in the ocean?

**Readings:**

*Marine mammals: Biology and Conservation: 220-232(Reader Compendium #18)*

*Abstract and chapter 1-9 (stop at pg. 593) Conner (2007): Dolphin social intelligence: complex alliance relationships in bottlenose dolphins and a consideration of selective environments for extreme brain size evolution in mammals. (Reader compendium #19)*

**Friday 30 March**

**8:30 – 9:50 DIS 10-A33**

**Lecture 16 –Hunting and Whaling - Ancient and Modern** A look at the ravages of "modern" whaling, aboriginal whaling and hunting and what sustainability means. Special examples of southern ocean whaling, aboriginal whaling and hunting in Greenland and the "grindedrap" in the Faeroe Islands.

**Readings:**

Burns & Wandesforde-Smith (2002): The International Whaling Commission and the future of cetaceans in a Changing world. Skip the notes (*Reader Compendium #20*)

**March 31- April 15**

**DIS TRAVEL BREAK AND OPTIONAL STUDY TOURS TOUR NO CLASS**

**Part 3: Marine Mammals on Population Level**

**Tuesday 17 April**

**8:30 – 9:50 DIS 10-A33**

**Lecture 17- Antarctic Seals**

**Guest Lecture:** Jonas Teilmann, Senior Scientist at the National Environmental Research Institute (NERI)

**Readings:**

Sineff et al. (2008): Opinion Projecting the effects of environmental change on Antarctic seals. *Antarctic Science* 20 (5): 425–435. (*On forum*)

DiGuardo et al. (2005): *Morbillivirus Infections in Aquatic Mammals: a brief overview*. *J Vet Med A Physiol Pathol Clin Med.* 52(2): 88-93 (*Reader Compendium #17*).

*Handouts on forum about Antarctic*

**Friday 20 April**

**8:30 – 9:50 DIS 10-A33**

**Lecture 18- Fisheries Interactions and Mitigation of Marine Mammal By-Catch**

**Guest lecture:** Senior Scientist Finn Larsen, DTU Aqua Institute for Aquatic Recourses  
Direct and indirect effects of fisheries activities on marine mammals from by-catch mortality to competition for food resources; efforts to reduce by-catch using the harbour porpoise as a case study.

**Readings:**

Kraus et al. (1997): Acoustic alarms reduce porpoise mortality. *Nature* 388: 525. (*Reader compendium #21*)

Read et al. (2004): By-catch of marine mammals in U.S. and Global fisheries. *Conservation Biology*, 20(1): 163-169. (*Reader Compendium #22*)

Larsen et al. (2007): Reduction of harbour porpoise (*Phocoena phocoena*) bycatch by iron-oxide gillnets. *Fisheries Research* 85: 270–278. (*On forum*)

**Tuesday 24 April**

**8:30-9:50 DIS 10-A33**

**Lecture 19- Class Discussion about the Baiji, the Vaquita, seal hunt and climate change with thoughts to whaling and by-catch**

**Readings:** Look at the internet for more info + read all the articles below carefully + find three discussion subjects for each topics/or questions

**Baiji** – Yang et al.(2006): Conservation Options for the Baiji: Time for Realisme? (*Reader Compendium #24*)

Wang et al. (2006): Conservation of the Baiji: No simple Solution by. (*Reader Compendium #25*)

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Reeves & Gales (2006): Realities of the Baiji Conservation by) (*Reader Compendium #26*)  
**Vaquita**- Rojas-Bracho et al. (2006): Conservation of the vaquita *Phocoena sinus* (*Reader Compendium # 27*)

D'Agrosa et al.(2000):. Vaquita Bycatch in Mexico's Artisanal Gillnet Fisheries: Driving a Small Population to Extinction? (*Reader Compendium #28*)

**Seal hunt** – NAMMCO Committee comments on Canadian seal hunt. (*Reader Compendium #29*)

Johnson et al. (1999): An evaluation of management objectives for Canada's commercial Harp seal hunt, 1996-1998. (*Reader Compendium #30*)

**Climate change**- Rosing-Asvid (2006): The influence of climate variability on Polar bears (*Ursus maritimus*) and ringed seal (*Pusa hispida*) population dynamics. (*Reader Compendium #31*)

Ferguson et al. (2005): Climate change and ringed seals (*Pusa hispida*) recruitment in western Hudson Bay. (*Reader Compendium #32*)

**Friday 27 April *\*\*Hand in term paper in both hard copy and digital to Maria\*\****

**8:30-9:50 DIS 10-A33**

**Lecture 20 – Danish Marine Mammals**

Read, A.J. & Hohn, A. A. (1995). Life in the fast lane: the Life History of harbor porpoises from the Gulf of Maine (*Reader Compendim #33*)

**Tuesday 1 May**

**8:30-9:50 DIS 10-A33**

**Lecture 21 – TBA**

***Readings:***

Clapham et al. (1999): Baleen whales: conservation issues and the status of the most endangered populations. (*Reader Compendium #34*)

**Friday 4 May- NO CLASS (Holiday)**

**Tuesday 8 May**

**8:30 – 9:50 10-A33**

**Lecture 22 — Sum up's and if time something about 'my' research**

**Friday 11 May**

**8:30 – 9:50 V23-201**

**Lecture 23 – Review**

**Wednesday 16 May: Final Exam**

**13:00-15:00**

**Location: TBA**