



FINAL EXAM IN BIO-2102

Exam in : **BIO-2101 Økologisk teori**

Date : **Monday 04. June, 2007**

Time : **09:00 – 13:00**

Place : **Aud.max., Administrasjonsbygget**

Approved remedies : **None**

The exam contains 4 pages including this cover page

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The questions have different weights (given in percent). When partitioning the time used to answer the questions consider their contribution to the total evaluation.

Question 1 (20%)

An experiment on the foraging behaviour of stickleback (a fish), presented the fish with two types of prey, large and small *Daphnia*. When 20 large and 20 small *Daphnia* were introduced, stickleback would eat exclusively large *Daphnia*. When 10 large and 30 small *Daphnia* were introduced, stickleback would feed on both prey size groups.

- i. Are the results consistent with optimal foraging theory (diet choice)? ii. What is the prediction of diet choice theory when the large, most profitable prey becomes scarce? iii. According to classical diet choice theory, how should stickleback adjust its diet in presence of other sticklebacks that eat the large *Daphnia*: select only large *Daphnia*; broaden its diet to include the small *Daphnia*; or select only small *Daphnia*?

Question 2 (20%)

In a field experiment on Red Grouse population dynamics, the grouse population stopped fluctuating when its members were treated with an anti-parasitary (to eliminate parasitic nematodes).

- i. How can a parasite influence the population growth rate of its host? ii. Can the nematode parasite regulate the grouse population, and if so how (hint: what is the mechanism of population regulation)? iii. Why does regulation from the parasite nematode produce grouse population cycles (hint: which property of the control mechanism destabilizes population dynamics – i.e. generates cycles)?

Question 3 (15%)

Carefully inspect the food-web diagram and answer the following questions.

- i. What effect will a sudden decrease in population F have on the size of population H?
- ii. What effect will a sudden increase in population F have on the size of population H?
- iii. What effect will a sudden decrease in population E have on the size of population H?
- iv. What effect will a sudden increase in population G have on the size of population F?
- v. What effect will a sudden decrease in population H have on the size of population E?
- vi. What effect will a sudden increase in population B have on the size of population J?

Question 4 (15%)

Global warming may favour the colonization of the Arctic by species from subarctic and temperate regions.

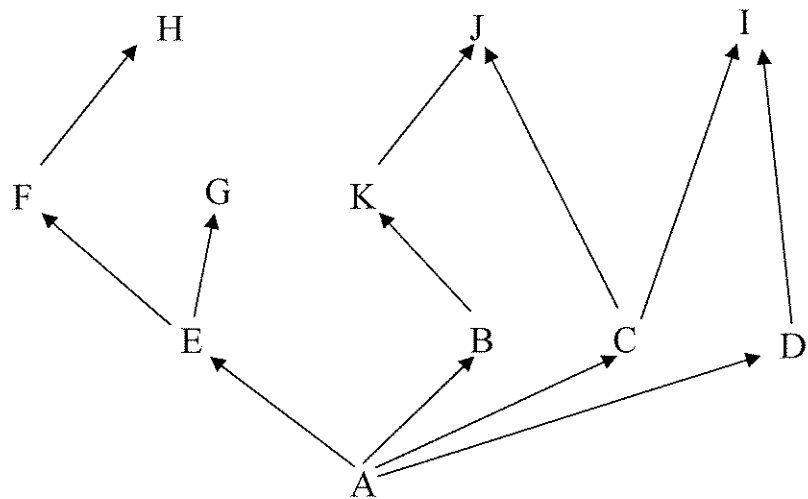
- i. What could be the effect of these invasions on competing Arctic species (hint: an important ecological principle tells that competition may lead to of the inferior competitor)?
- ii. What could be the impact of invasive predators on Arctic prey communities (mention and explain at least one effect)?

Question 5 (15%)

On your first day as resource manager you are asked to choose one of three areas for a natural reserve (the other two areas will be used for agriculture). The three areas have the following characteristics: A. a small, isolated fragment of forest; B. a large, isolated fragment of forest; C, a large fragment of forest close to the edge of a forested region. Your goal is to choose the area that will ensure the conservation of the highest number of species. Use the theory of island biogeography to choose the best area (A, B, or C) and explain your choice.

Question 6 (15%)

A female of red grouse can produce up to 9 eggs, but the typical clutch size is only 6 eggs. Why should grouse produce an intermediate clutch size rather than the maximum clutch of 9 eggs? (hint: life history theory on clutch size)



A food-web (question 3). Arrows start from the prey and point to the predator.