



NTNU – Trondheim
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Department of Biology

Examination paper for BI3037 Freshwater ecology

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Examination date: 04.12. 2014

Examination time (from-to): 4

Permitted examination support material: None

Other information: All tasks count equal.

Language: English (Answers may be given in norwegian or english)

Number of pages (front page excluded):

Number of pages enclosed: No aids.

Task 1.

Water

- a. Explain how lakes are formed and types of lakes.
- b. Give factors affecting the pattern of stratification between different lakes.
- c. What is the Redfield-ratio?
- d. Mention different techniques used in lake restoration of eutrophic lakes.

Task 2.

Predation

- a. Describe the predation cycle – the different stages of a predation event.
- b. Describe different types of primary defense.
- c. What is inducible defense and what mechanisms may be involved?
- d. What is an ontogenetic niche-shift?

Task 3.

Energetics

- a) Present the energy budget of fish as an equation and explain what the different components are.
- b) Describe a general pattern between temperature and fish growth. Explain why the temperature maximizing fish growth depends on food ration (hint: focus on the effect of temperature on consumption and metabolism, and draw figures).
- c) When looking at specific growth rates in fish we typically see that it decreases with increasing body size. Discuss the potential reasons for this.

Task 4

Population dynamics

- a) Draw the four main types of Stock-Recruitment relationships and explain the differences among them
- b) The data in the table below are adult counts from a recently established population of a semelparous annual fish species. Based on the data, draw a stock-recruitment curve (by eye) that you think best fit the data, as well as the corresponding replacement line. What type of information does this give us?

Year	Count
1	100
2	211
3	382
4	655
5	1268
6	2408
7	4597
8	7318
9	8000
10	9085
11	7054
12	8286
13	7912
14	9655
15	8000
16	7166

c) Draw a stock-recruitment curve and add the replacement line for a situation where you have density-dependence both from the stock to the recruit stage as well as from the recruit to the stock stage.

d) Define reproductive rate for parasites. Use a model for the reproductive rate of microparasites to explain how parasites may contribute to density-dependence in fish populations.

Checked by:

Date

Signature