



NTNU – Trondheim
Norwegian University of
Science and Technology

Department of biology

Examination paper for BI3063 Biological and genetic stock management

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Examination time (from-to): 09:00 – 13:00

Permitted examination support material: Calculators Citizen SR-270X, Citizen SR-270X College, HP 30S and Casio fx-82ES Plus

Other information: Exam questions are equally weighted

Language: English

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Informasjon om trykking av eksamensoppgave

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Checked by:

Date

Signature

ENGLISH

Question 1

- a) Explain (using text, graphics and formulae) the conceptual and mathematical basis for the MSY concept.
- b) Why does not “one model fits all” apply to stock management based on MSY, and what basic information about a stock is typically needed to fit an MSY for it?
- c) Describe briefly the international and national participants, their management tools, and the work flow in implementing an MSY on a fish stock in Norway.
- d) How is “Ecosystem based management” differing from the more traditional one?

Question 2

- a) Outline the main traits of the life history of the North East Arctic Cod. Draw a map as necessary.
- b) Describe cases where the development in catch technology has been identified as a cause of the collaps of commercially important fish stocks in the North Atlantic.
- c) What is a "Petersen estimate" and how is it used? Give a numerical example.

Question 3

- a) Phrase "the biological definitions" of species and populations, respectively.
- b) What is meant by the term “Genetic structure” of a species?
- c) What are the observed differences in the genetic structure in limnic, anadromous and marine fish species, and what is assumed to be the explanation for the differences?
- d) What is meant by the term "isolation by distance"?
- e) What is meant by the term "metapopulation"?

Question 4

- a) Define the term "Effective population size" (N_e) with words.
- b) What is “Random Genetic Drift”, and how is it related to N_e ?
- c) Explain the terms "observed heterozygosity" and “expected heterozygosity”.
- d) How much is the heterozygosity reduced by random genetic drift each generation?
- e) What is the formula for N_e for unequal numbers of males and females in matings?
- f) What is the formula for N_e for mitochondrial genes (mtDNA)? Explain the reasoning.