BSc Degree Examinations 2018-9

Department: BIOLOGY

Title of Exam: Conservation Ecology and Biodiversity

Time Allowed: 2 Hours

Marking Scheme:
Total marks available for this paper: 100
Section A: Short Answer / Problem / Experimental Design questions (50 marks)
Section B: Essay question (marked out of 100, weighted 50 marks)
The marks available for each question are indicated on the paper.

Instructions:
Section A: Answer all questions in the spaces provided on the examination paper
Section B: Answer either question A or question B. Write your answer in the green answer booklet provided and attach it to the back of the question paper using the cable tie provided.

Materials Supplied:
CALCULATOR, Green Answer Booklet

DO NOT WRITE ON THIS BOOKLET BEFORE THE EXAM BEGINS
DO NOT TURN OVER THIS PAGE UNTIL INSTRUCTED TO DO SO BY AN INVIGILATOR
SECTION A: Short Answer Questions
Answer all questions in the spaces provided

Question 1.
Red grouse are legally hunted on grouse moors in the UK. They are sexually mature at one year. Adult annual survival is 0.47 but 63% of chicks die before maturity. Females lay a single clutch per year with an average of 7.2 eggs. 12% of nests are predated before fledging.

a) On a large grouse moor with 8,230 pairs of grouse, how many individuals could be shot without reducing the population? (5 marks)
b) The figure below shows a standardised index of the number of grouse shot in the South Pennines each year since the late 19th Century. The Bag Index plotted on the y-axis shows the numbers of grouse shot each year relative to 1860. This Bag Index is assumed to be a good indicator of the actual population of grouse. Based on your observations of this population time-series, evaluate what type of harvesting model is most sensible and the advice you would give to a grouse moor manager about harvest rates. (5 marks)
c) If Hen Harriers are present at natural densities on a grouse moor, they can eat all the surplus productivity before shoots occur. Illegal killing of Hen Harriers is common and the UK population of Hen Harriers is a tiny fraction of the expected population without illegal activities. Outline a research programme that could provide information on the rate of illegal killing of Hen Harriers and regions where most occurs.  

(15 marks)
**Question 2.**

Tropical forests are being fragmented, resulting in landscapes that vary in the size and location of patches that remain, with some landscape containing a few large patches (‘type 1’ - see schematic below) or many smaller patches (‘type 2’). Imagine you are working for a tropical conservation organisation which is wanting to understand how changes in tropical forest cover affect biodiversity in the landscape. You are working in South East Asia, where forest is being converted to agricultural (oil palm) areas.

Rainforest - represented by dark grey squares
Non-forest oil palm areas represented by white squares

a) Design an experiment to quantify how bird diversity changes in forest landscapes following fragmentation, and whether type 1 landscapes support more bird diversity than type 2. Describe the methods you would use to carry out this research investigation, including the data you would collect, how these data would be analysed, and the expected graph and statistical outputs. (10 marks)
b) The conservation organisation is aware of the detrimental impacts of edge effects. Explain how you would examine if edge effects penetrated further into the small forest patches (i.e. in landscape 2) than in larger patches (i.e. in landscape 1).  

(8 marks)
c) Your study finds that local bird species richness per unit area is higher in forest areas in landscape 1 than in landscape 2. Discuss the ecological mechanisms that might explain this (4 marks). Which ecological traits of species may make them most vulnerable to local extinction (3 marks)? (7 marks)
SECTION B: Essay question

Answer one question in the green answer booklet provided.

Remember to write your candidate number on the front of the answer booklet and indicate whether you have answered question A or B at the top of the page.

Mark total for this section: 50

EITHER

A. Concerns about the rapid loss of biodiversity have led to radical proposals for conservation, including a famous conservationist proposing that “half of the Earth's land should be designated a human-free natural reserve to preserve biodiversity”. Discuss the pros and cons of this approach, and howlandscapes might be designed to protect 50% of land through this global land-sparing approach.

OR

B. Non-native species are increasingly a feature of human-modified environments across the world. Write an essay to advise UK environmental agencies and government on when and how to intervene in biological invasions, so as to maintain biodiverse ecosystems.