UNIVERSITY OF ESWATINI

FINAL EXAMINATION PAPER 2018/19

TITLE OF PAPER: ECOLOGICAL TECHNIQUES 1

COURSE CODE: BIO603

TIME ALLOWED: THREE HOURS

INSTRUCTIONS: 1. THE EXAMINATION HAS FOUR (4)
QUESTIONS. ANSWER ANY THREE (3).
2. EACH QUESTION CARRIES 30 MARKS.
3. ILLUSTRATE YOUR ANSWERS WITH
LARGE AND CLEARLY LABELLED DIAGRAMS
WHERE APPROPRIATE.

SPECIAL REQUIREMENTS: NONE

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATORS

QUESTION 1

You have been given the task of estimating the population size of Stanley's Bustard inhabiting montane grasslands at Malolotja Nature Reserve, Eswatini. This is a large, turkey-sized bird that spends most of its time walking in short grasslands, and can be readily detected (because of its large size) from over 50 m away. Give a detailed account of: 1) how you would collect the relevant data; 2) how you would analyze the data to get estimates of population size; and 3) the assumptions and biases involved in your method.

[30 Marks]

QUESTION 2

What is Occupancy Modeling and when should it be used? Make sure to use real-life examples to illustrate your answer.

[30 Marks]

QUESTION 3

The program MARK is a very powerful tool for calculating estimates of survival for animals. Explain how the program functions (do not go into details of the statistics), and what it is capable of contributing to survival studies. Use real-life examples to illustrate your answer.

[30 Marks]

QUESTION 4

Results below are outputs from PRIMER v5 based on a study of birds at 10 sites in the Lowveld of Eswatini. Three separate sets of results are shown (A, B and C). Explain what these three outputs are showing, and interpret the results from an ecological point of view.

A) Non-metric MDS ordination of sites by bird species composition (Veg = vegetation type. A = acacia, B = broadleaf woodland, C = riparian).
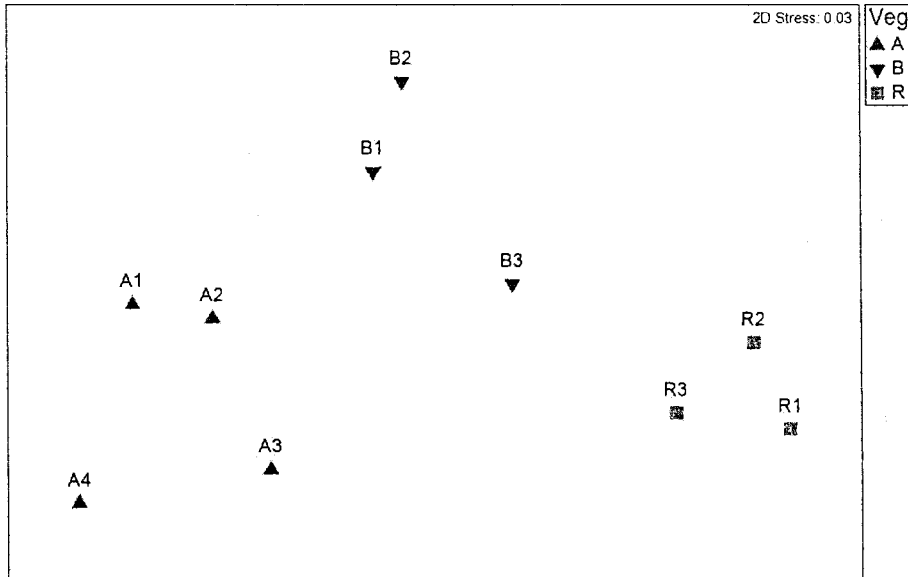
B) ANOSIM (Analysis of Similarities)
Vegetation levels: A, B, R

Tests for differences between unordered Veg groups
Global Test
Sample statistic (R): 0.975
Significance level of sample statistic: 0.2%
Number of permutations: 999 (Random sample from 2100)
Number of permuted statistics greater than or equal to R: 1

C) SIMPER analysis, showing the top 5 species (labelled by numbers e.g. "672") per vegetation type.

Group A
Average similarity: 45.96

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
672	232.93	7.41	4.44	16.12	16.12
844	372.93	7.21	1.46	15.70	31.81
829	122.48	3.77	3.43	8.20	40.01
541	61.68	2.14	9.82	4.65	44.66
787	71.85	1.84	1.67	4.01	48.67

Group B
Average similarity: 52.15

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
787	88.27	5.24	3.39	10.06	10.06
568	79.30	5.14	4.89	9.86	19.91
753	108.53	4.69	0.97	9.00	28.91
701	40.17	3.17	24.01	6.08	34.99
354	40.33	2.69	35.07	5.16	40.15

Group R
Average similarity: 69.92

Species	Av.Abund	Av.Sim	Sim/SD	Contrib%	Cum.%
657	361.17	13.10	14.05	18.73	18.73
569	345.20	12.37	15.61	17.69	36.42
568	329.07	10.10	8.87	14.45	50.87
648	188.57	6.73	14.26	9.62	60.49
793	134.67	4.31	3.62	6.16	66.65

[30 Marks]