COMP10001 Foundations of Computing

Project 1
Biodiversity and Birdwatching

Due: 27 April 2020

What is biodiversity?

Biological + diversity

The variety of all living things

Why is biodiversity important?

Ecosystems with a more diverse range of species are:

- more productive: they support a greater volume and variety of life

- more robust: they recover from natural disasters more rapidly

- more enjoyable: offering opportunities for recreation

How do we measure biodiversity?

We can typically only observe and sample part of our environment.

Birds are a useful indicator species:

- Widespread across the world
- Relatively easy to observe, and lots of (visible) variety
- Highly mobile, if they don't like their environment they will move
- Different bird species rely on different features of their environment (eg, specific tree species, waterways, etc), therefore they can provide a rich view of environmental quality
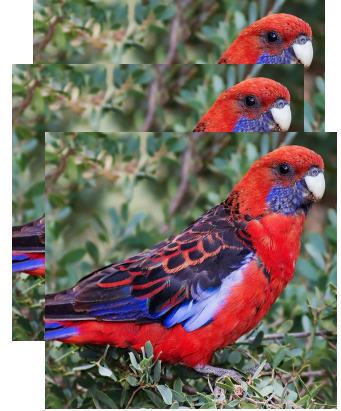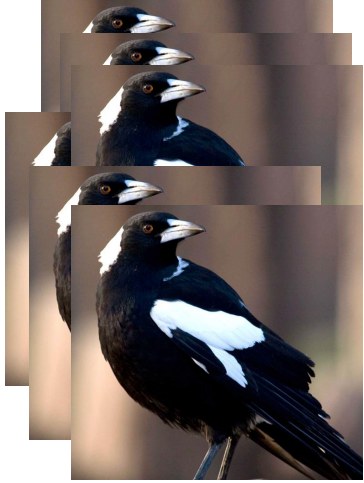
Question 1: Species Richness

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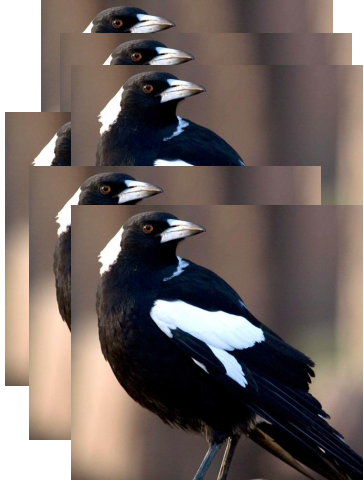
Question 1: Species Richness

5

Question 2: Species Evenness

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6   3   1   2   3

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Counts:

6   3   1   2   3

Total observations: 15

Proportions:

0.4   0.2   0.07   0.13   0.2

Question 2: Species Evenness

Simpson's index:

$$\gamma = \Sigma_i p_i^2$$

$$= 0.4^2 + 0.2^2 + 0.07^2 + 0.13^2 + 0.2^2$$

$$= 0.28$$

Question 2: Species Evenness

Simpson's inverse index:

$1/\gamma = 1/0.28$

$= 3.57$

Question 3: Comparing habitats

Question 4: Optimal sampling of habitats

1:

2:

3:

4:

5:

6:

When should we stop sampling?

Stopping rule: stop when we have completed x visits in which we haven't seen at least y new species.

eg, if x=1 and y=1, we would stop after visit 4, as we would have completed 1 visit in which we didn't observe at least 1 new species.
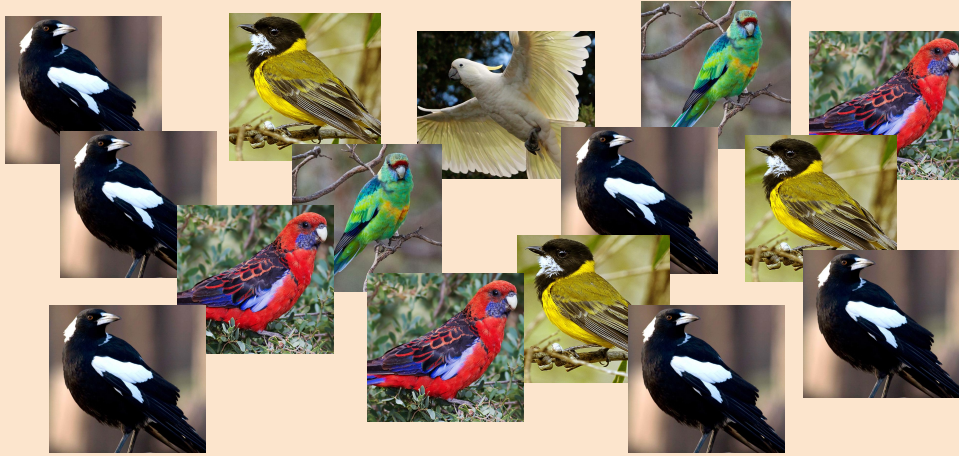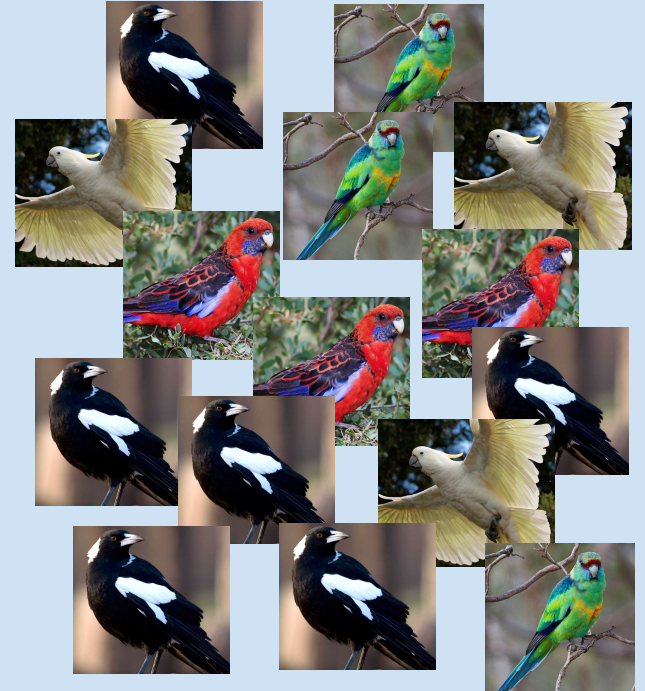
Question 4: Optimal sampling of habitats

When should we stop sampling?

After visit 4, we have observed 4 different species, out of 5 that we would have observed had we completed *all* visits.

Therefore we observed 4/5 (0.8) of the actual species diversity present.

Question 5 (Bonus Question!) Predicting species

100111 M Y W	100111 M Y W	111100 M	101110 M Y	110101 M W
101011 Y	111100 M	101110 M Y	110011 Y	111010 Y
011011 ?	111100 M	101011 Y	100111 M Y W	100111 M Y W
100111 Y	101011 ?	111100 M	101101 M W	111001 ?
110101 M W	011101 W	110110 ?	010111 W	111100 M