Key Stage 5 Worksheet

Earth LIVE Lessons: What Can We Learn From Orangutan Nests?

What is it about?

In this video, Sol Milne, PhD candidate at the University of Aberdeen talks about:

- His research in Sabah, NE Borneo.
- Orangutan Ecology.
- How he uses drones to find habitats, nests, and how they are distributed.

Watch the video here: youtu.be/6BaJPw91101

Open the file in your web browser to click on the links.

Some key facts:

- Orang-Utan means ‘forest people’ in Malay.
- Orangutans used to be widely distributed across SE Asia but are now only found in Sumatra and Borneo. There are only around 70,000 individuals left; a reduction of 50% compared to 20 years ago.
- There are three extant (still in existence) species of orangutan, the third reported as distinct only in 2017:
    - Bornean orangutan (*Pongo pygmaeus*).
    - Sumatran orangutan (*Pongo abelii*).
    - Tapanuli orangutan (*Pongo tapanuliensis*).
- Several species are extinct, for example the giant orangutan – *Gigantopithecus blacki*.
- Sol is studying a sub-species, *Pongo pygmaeus ssp. Morio*, which is critically endangered.

Background

Orangutan Nesting Behaviour

- Orangutans, like humans and other apes, spend a lot of time with their mothers. Orangutan infants stay with their mothers for up to 9 years. Chimps and gorillas stay for around 5 years. This is because orangutans need to learn some complex behaviours in order to survive. For example, orangutans need to learn how to build nests. They build a new one almost every day, and even add umbrellas.
    - Nests are used for rest in the day and to sleep at night and have to be strong enough to prevent them from falling to the ground.
    - This is how they stay dry in the rainforest, especially at night. They are also used to prevent hypothermia, and to protect themselves from ground predators such as the leopard, which doesn't tend to look up!
    - Probably 99.9% of us would fall out of the tree if we tried to build a nest. Mothers communicate to their juveniles how to build the nests.
- Orangutans are unique - gorillas build nests on the ground, chimps build them slightly higher up, but orangutans can be found near the top of the canopy.
- Sol and his team wanted to find out where orangutans build their nests, where they are in relation to people, the distance from buildings and agriculture – and if this is having an impact on them. They used drones to do part of their research.

Drones

- Sol's work is based around using drones to study orangutan habitat.
- A fixed-wing drone, with one propeller, built from scratch, can fly for an hour before it loses battery. It's something you can learn to do too.
- How did they do the surveys before drones?
    - They would walk along the ground, about 2 km in a straight line (a 'transect'). However, it was impossible to walk through some of the thick undergrowth. They were also at risk of being attacked by bees and elephants.
    - Whenever they would spot a nest, they would identify the species from nest, the size of the nest, and estimate the size of the population.
    - Drones are able to do a similar thing, over a larger area.

Background continued

Orangutans are masters in phenology – predicting the onset of seasonal changes, such as the blooming of flowers. There is concern at the moment, with Climate Change, as the phenology of plants is changing.

Orangutans can move over a range of up to 5 km in a day. They are as big as people, or sometimes even bigger, so they need a lot of food and have to travel to find it.

Strangler figs are a keystone species for the orangutan and provide them with a huge amount of fruit. The trees produce fruit almost constantly, two or three times per year, and are a rich source of calcium.

The strangler fig is a hemi-epiphytes. This means it germinates (starts to grow) near the canopy, but its roots grow downwards, where they will eventually reach the ground. They start growing from the dung of fruit bats.

It may be called a strangler fig, but it doesn't strangle the tree physically. Instead, it out-competes the tree for light, as the strangler fig usually grows faster than its host tree. When the strangler fig matures, the original tree dies, and you are left with an exoskeleton of the tree.

It is important that orangutans have a diet containing calcium-rich foods (such as the fruit from strangler figs) to maintain strong bones. An orangutan with a calcium deficiency would be at risk of breaking bones if it fell from the canopy.

Orangutans play an important role in reforestation, as they are vital in seed dispersion.

Borneo's forests are very fragmented, so it is difficult to get from one section of forest to another.

Banyan trees (or strangler figs) are revered by locals and have a cultural significance. Because of this, they are often left behind even when forests are logged. Oil palm plantations will often also still have strangler figs. In degraded forest (where trees have been lost) orangutans will sometimes climb down from the canopy and move across the ground to reach a food source. This is energetically expensive for them as they have evolved to move through the trees, not walk along the ground, like us.

Orangutans move through the trees by pulling branches and swinging (brachiation).

The meta-population of orangutans (the movement of males through sub-populations) maintains the genetic health of orangutans.

Find out more about it

- Sol Milne is available to respond to questions on social media (**@Sol.milnea** and **@OrangutanSurvey**).
- More information about the citizen project can be found here: **Orangutan Nest Survey.**
- Find out about the palm oil in many household products, and how you can help prevent logging in the SE Asian rainforest at the **Orangutan Foundation Website.**
- Explore which orangutans, and other species, are critically endangered **on the IUCN Red List.**
- Read the book '**God, Wasps, and Stranglers**' to find out more about the keystone fig tree that the orangutans depend on.

Questions

Interactive: Click on box to start typing

How related are we (humans) to the Orangutan? Can you find some key similarities and differences?

What is a keystone species? Can you identify any keystone species in your local or another habitat?

How do the roots of an epiphyte absorb water and nutrients before it reaches the ground?

How are seeds dispersed in NE Borneo?

What is a 'meta-population' and why is it important that the genetic health of the remaining orangutan populations is maintained?

At home 'Practical'

- Try to identify orangutan nests and fig trees from home using images taken by Sol and his team: **www.zooniverse.org/projects/sol-dot-milne/orangutan-nest-watch/classify**
    - How many can you spot?
    - Can you calculate the number of nests by area?
    - How many individuals do you think are in the area?
    - Why would it be hard to tell the number of individuals from the number of nests?
- Design your own citizen science experiment using technologies such as unmanned aircraft and drones. This could be an area local to you, or one that is difficult to reach.
    - What ethical and safety considerations would you have to take into account
    - before starting the project?
    - What is your research question?
    - What is your hypothesis?
    - What are your limitations?
    - How would you conduct the experiment?
    - What data would you collect and how would you process it to answer your research question?
- 'Looking for a project?' Asks Sol, 'Build a drone. Good home project.' Of course, ask permission from a responsible adult first and make sure you know the rules on flying drones in your area, **here is information for the UK.**

For teachers and home schoolers

Links to Science in the National curriculum for Wales (KS5)

AS UNIT 2
Biodiversity and Physiology of Body Systems

[1] All organisms are related through their evolutionary history

[3] Adaptations for Transport

[i] the structure of the dicotyledon root, including examination of microscope

[j] the absorption of water by the root

[4] Adaptations for nutrition

[i] the adaptations of herbivore guts and dentition, in particular ruminants to a high cellulose diet and the adaptations of carnivore guts and dentition to a high protein diet, including examination of skulls and dentition of a herbivore and a carnivore

A2 UNIT 3
Energy, Homeostasis and the Environment

5. Population size and ecosystems

[a] populations and the way in which they grow - a simple quantitative treatment

including immigration, emigration, birth and death rates

[b] graphs showing population growth and factors affecting population growth;

competition; carrying capacity

[c] the regulation of populations by density dependent and density independent factors

[d] the sampling techniques used to assess abundance and distribution of organisms in a habitat

[e] the concept of ecosystems, including that ecosystems range in size from very large to very small

[g] the concepts of habitat and community

Variation, Inheritance, and Options

[2] Sexual reproduction in plants

Working scientifically

Use of ICT such as computer modelling in studying population change and predator-prey relationships. There is also opportunity for fieldwork in investigating the distribution and abundance of organisms in a habitat.'

Mathematical Skills

E.g. 'the study of biomass transfer in this topic and also in sampling techniques and statistical analysis. These include making use of appropriate units; using expressions in decimal and standard form; using ratios, fractions and percentages; use of significant figures; finding arithmetic means; construction and interpretation of tables and diagrams; translating information between graphical, algebraic and numerical forms; use of a scatter diagram; plotting variables from experimental data; determining the intercept on a graph; drawing and using the slope of a tangent to a curve as a measure of rate of change. Learners can develop skills in using logarithms in calculating and plotting population growth.'

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