

Big Picture Biology

Student Workbook

VCE Biology Unit 1 & 2

What do we need to know about an endangered species in order to save it?

Big Picture Biology provides a unique insight into how the VCE biology concepts are being used in real life by Zoos Victoria to save endangered species. You will learn how to apply the biological knowledge we need to save endangered species from extinction. The four case studies investigated during your excursion include:



Philippines Crocodile



Southern Corroboree Frog



Helmeted Honeyeater



Asian Elephant

The program consists of both zoo educator-led and self-directed activities. A zoo educator will lead activities and discussion at two locations; **DigestEd** and the **Elephant Barn**.

You will need to visit **World of Frogs** and the **Helmeted Honeyeater** aviary to collect information independently.

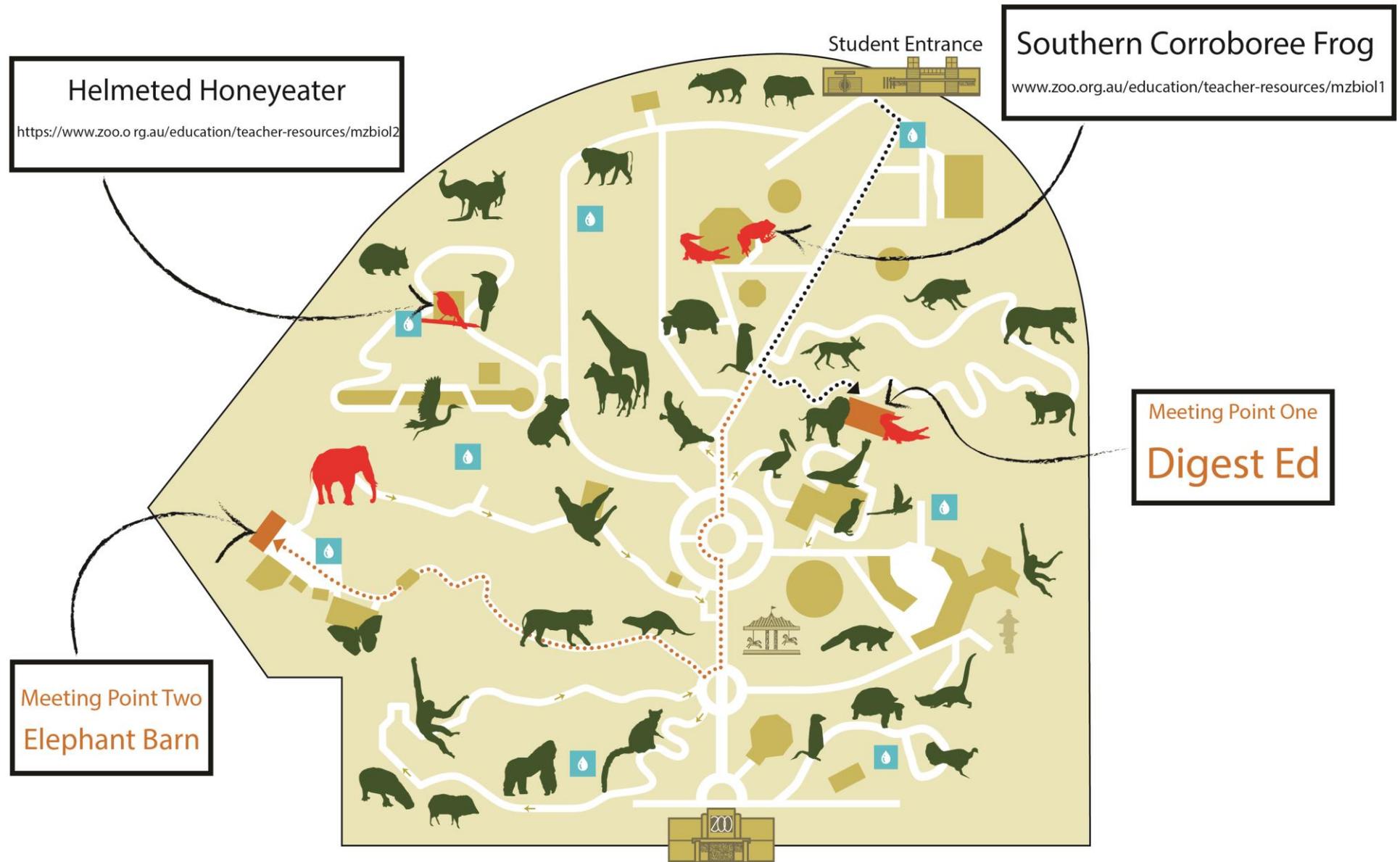
Please note: we will not complete booklets during the educator-led sessions. Please record information and collect data in logbooks to complete posters back at school. This booklet will guide you to collect the necessary information during your excursion.



The Melbourne Zoo Learning Experiences Team, respectfully acknowledges the Wurundjeri People, the Traditional Custodians of the land on which we work, live and learn. We recognise their continuing connection to land, water and wildlife and pay respect to Elders past, present and emerging.

Melbourne Zoo map

Use the map to help you explore Melbourne Zoo and find your meeting points. When you visit the **Southern Corroboree Frog** and **Helmeted Honeyeater**, gain the data you need by visiting the provided web pages.



Philippines Crocodile (*Crocodylus mindorensis*)

The effects of temperature on sex determination

Introduction: The Philippines Crocodile is a critically endangered species found in a small range of islands in the Philippines. The species is under threat from habitat destruction and practices such as dynamite fishing. The number of individuals surviving in the wild may be only in the hundreds. To protect this species Zoos Victoria has a captive breeding program. For this program to be successful, both males and female offspring need to be produced.

Hypothesis: The gender of hatchlings is determined by the temperature at which eggs are incubated.

In your log book, record at least three new facts you find out today about the Philippines Crocodile.

Method: Philippines Crocodile eggs laid at Melbourne Zoo were removed from the nest at two days and incubated at one of the following temperatures:

28°C, 29°C, 30°C, 31°C, 32°C and 33°C

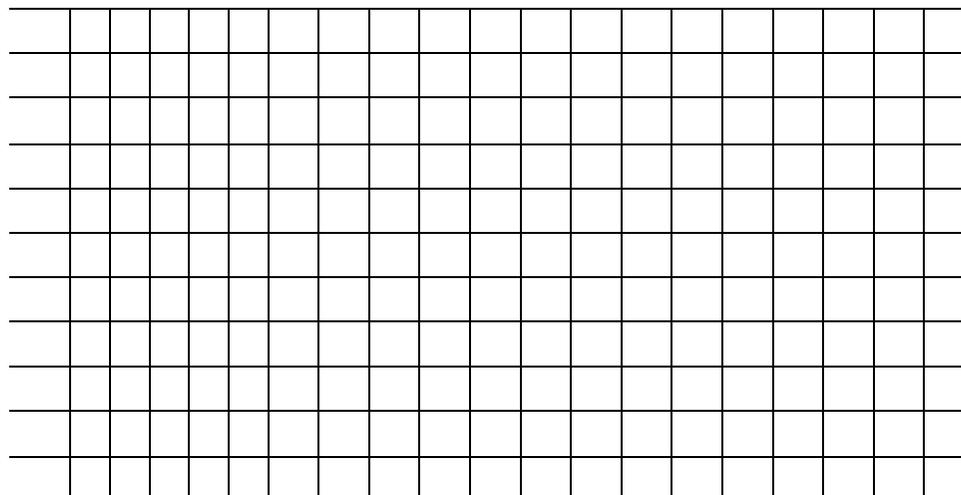
After the eggs hatched the gender of each of the hatchlings was recorded.

In your log book record the temperature each egg was incubated at and the gender of the crocodile that hatched from it.

Then work out the percentage of females that hatched at each temperature increment.

Results: Use your log book to record the temperatures at which eggs were incubated and the gender of the individual that hatched from them.

Show your results on the graph below. Don't forget to label the axis.



Are there any trends on your graph? Describe them below:

Conclusion:

Summarise your findings.

Explain how they could be of use to captive breeding programs.

If there was to be a dramatic change in air temperature, considering your results, how might this impact the Philippines Crocodile?

The effects of introduced fungus *Batrachochytrium dendrobatidis* on wild populations of the Southern Corroboree Frog

Introduction: The Southern Corroboree Frog is a critically endangered species found at Mt Kosciusko. Since 1989 the wild population has declined dramatically. It is believed that this is primarily due to the introduction of chytrid fungus *Batrachochytrium dendrobatidis* (Bd).

Hypothesis: Due to the effects of Bd the Southern Corroboree Frog population has declined further in 2016.

In your log book you should record the following:

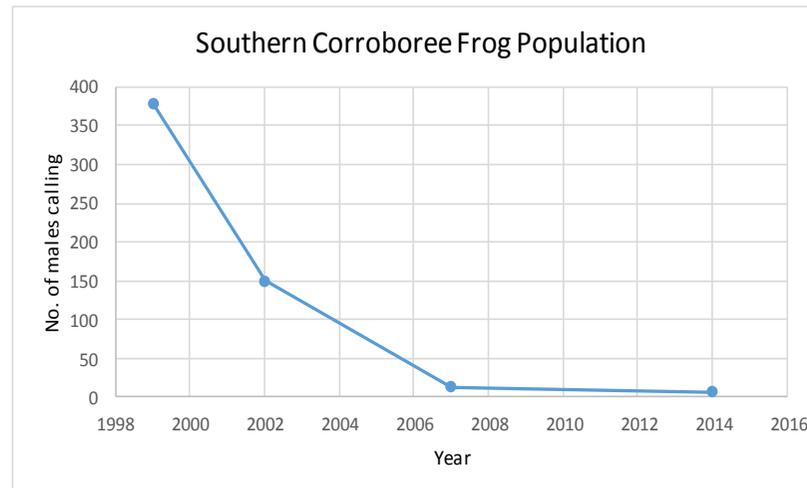
- *diagram of the lifecycle of Bd*
- *name of the frog species which is believed to be spreading Bd through the Corroboree Frog's habitat*

Method: Male calls are believed to be a good indication of population health.

Using the calls of the male Southern Corroboree Frogs, we are able to make a prediction about the current population for the species.

Listen to the recordings of wild populations provided and record in your log book how many different males you can hear for 2016.

Results: Add your results to the graph below.



What has happened to the wild population of Southern Corroboree Frogs since 1999?

Use your graph to predict the Southern Corroboree Frog population in 2017.

What can you infer about the wild Southern Corroboree Frog population?

Conclusion:

What is the likely future for the wild population of Southern Corroboree Frogs?

Discussion:

Explain what is being done to recover the wild population:

References:

<http://www.zoo.org.au/education/teacher-resources/mzbiol1>

Introduction: The Helmeted Honeyeater is Victoria's Bird Emblem and one of Australia's most endangered species. It has been bred in captivity since 1989. Cross-fostering has been an important element of the captive breeding program.

In your logbook draw a diagram or flowchart that explains the process of cross fostering.

Mathematical models are often used to predict future population sizes in endangered species breeding programs.

Hypothesis: Cross fostering will result in a significant population increase when used over three generations.

Method: Using a mathematical model, predict the outcome of cross-fostering;

52 Helmeted Honeyeaters are divided evenly into 2 breeding groups, **Group A** and **Group B**. Group A acts a **control group** and is allowed to breed normally—producing one clutch per year. Group B has all eggs removed and cross fostered from the first clutch so then produces a second clutch.

The model will have the following parameters;

- Each pair produces a clutch of two eggs.
- Both eggs hatch and produce one male and one female.
- These hatchlings survive and are able to breed the following year.
- The original 52 birds will breed each year.
- All hatchlings will breed each year after they are born and increase the number of the group they came from.
- Inbreeding does not need to be considered for this model.

Your working out should be recorded in your log book.

Cross-fostering of Helmeted Honeyeater (*Lichenstomas melanops cassidix*) eggs with Yellow-tufted Honeyeaters (*L.m.meltoni*) to increase young produced per season.

Results: Completed in the table below.

	Group A	Group B	Difference
Year 1			
Year 2			
Year 3			
Total			

Which group produces the most young each year?

What happens to the difference between group A and group B as each year passes?

Discussion:

What are the limitations of the mathematical model?

What are the potential problems that could arise from the cross-fostering program?

Explain whether or not you would recommend cross-fostering.

References:

<http://www.zoo.org.au/education/teacher-resources/mzbiol2>

Introduction: The Asian Elephant is an endangered species whose numbers are still decreasing. Many zoos are taking part in a breeding program.

Why do you think Zoos Victoria are trying to breed elephants in captivity?

Hypothesis: It is possible to predict the optimal time for Artificial Insemination through testing.

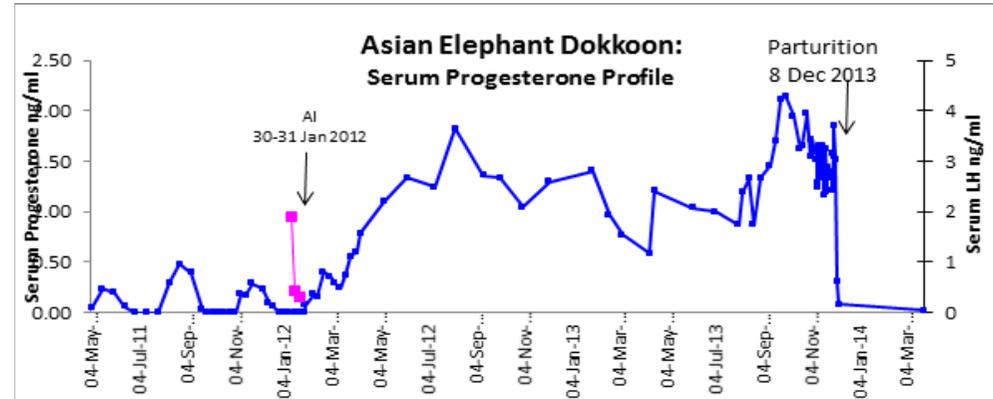
Method: In order to identify the oestrus cycle of female Asian Elephant Dokkoon, blood samples were taken on a regular basis. When her cycle had been determined, Artificial Insemination (AI) was performed using sperm from bull Bong Su. Blood samples were then taken again daily to establish whether AI had been successful or not.

In you logbook you should explain:

- How the blood samples are taken
- The Artificial Insemination process
- The steps keepers take to limit the size of the Elephant calf

Artificial insemination of a female Asian Elephant (*Elephas maximus*) at Melbourne Zoo

Results: Use the graph to answer the questions below.



On what date did AI take place?

Was the AI was successful and what indicates this?

Why do you think the frequency of blood tests increased around November 2013?

Conclusion:

Discuss the benefits and limitations of the using AI to breed Asian Elephants. Would you recommend using AI in the future?

Quantitative Data Collection – Asian Elephant

Name of observer(s): <i>Circle one of each</i>	Day/Date:	Time:
Individual observed: Bong Su / Mek Kapah / Dokkoon / Num-oi / Kulab / Mali / Ongard / Man Jai	Age: Calf / Adult	Sex: Male / Female
Weather: Sunny / Overcast / Raining	Hot / Warm / Cold	Still / Windy

Use the behaviour key to record your animal's behaviour every _____ seconds.

1	9	17	25	33
2	10	18	26	34
3	11	19	27	35
4	12	20	28	36
5	13	21	29	37
6	14	22	30	38
7	15	23	31	39
8	16	24	32	40