Student Sheet

# The Evolution of *Canis pedatus*

Name:_____ Period:_____

**Introduction:** In this activity you will imagine that 800 years ago an international expedition discovered a previously unknown dog-like creature. The expedition's leaders, all from different Islands of the world, each took several hundred of the species on board their vessels and returned to their own lands. The animals were originally held in captivity and allowed to mate randomly. Their numbers increased and eventually most of them were set free to roam. You are to decide if the animals could have survived in their new habitat and then, if they had survived, how the animals could have changed over 8 centuries as they adapted to their new environments.

**Objectives*:*** The purpose of this activity is to decide:

- If a population of the species *Canis pedatus* would survive being relocated to a new environment;
- If the species *Canis pedatus* would show adaptations to its new environment over a period of four hundred years;
- Whether the animals with those adaptations still belong to the species *Canis pedatus.*

**Background information on the species *Canis pedatus:***

Height: medium, similar to a spaniel
Hair: medium length, brown, white, black mix
Tail: bushy, hangs down to its heels
Snout: long, similar to a collie, with medium-sized teeth
Ears: short and pointed
Feet: unusually large, with small sharp claws
Poor night vision
Moderate runner: runs at speed of the average house cat
Omnivorous, but has a particular liking for small birds

**Environments:**

**Island A**
The island is fairly flat, with an occasional hill. The ground is soft dirt, and several species of shrubs grow towards the center of the island. There is no animal life on land, but the water is teaming with fish. The island is surrounded by a coral reef, which keeps the predators out. The shore is sandy with no algal growth. Fresh water is available.

**Island B**
The island has a rocky shoreline. Numerous tide pools dot the island along the shore where the wave action is somewhat sheltered by rock outcrops. The tide pools host barnacles, abalone, sea urchins and crabs. Algae grows all around the island; however, it is quite sparse in the tide pools where the various animals feed. The current is quite strong along the rocky outcrops where the algae grows best. Fresh water is available.

**Island C**
The island is somewhat barren. A few species of cactus thrive on the bare rocks. A large cactus-eating tortoise inhabits the island. A species of very large bird nest on the island annually. They build their nests on the rocks, and protect their eggs from the sun by standing over the nests with outspread wings. The nests are always found on the windy side of the island which is somewhat cooled by offshore breezes.

**Island D**
The island is an extinct volcano. Vegetation on the island changes with the altitude moving up the volcano. Grasses grow at the base. Further up the slope the grasses give way to low shrubs. Half way up, the island becomes quite lush; tropical plants and trees dominate the landscape. At this altitude, the island experiences frequent rain showers. There are two species of birds that inhabit the island. One is a raptor, which preys upon the smaller birds. The other fishes the waters approximately one mile offshore. Both nest in trees.

**Procedures:** You will be assigned to groups and each group will be given a letter that corresponds to an environment. As a group you must complete the following tasks and questions.

1. As a group, decide if the species could have survived after being allowed to roam in the wild, given their characteristics and lifestyle. Explain your decision.

2. Examine the traits the dog population began with. Describe how each trait might be influenced by natural selection and the environmental factors that provided the pressure for change. Record every change that could have occurred, together with a statement to explain the functional benefit of the change.

3. Provide a written description of the animal and its lifestyle. Include a food web, a discussion of energy use and conservation, nocturnal or diurnal, habitat etc.

4. Include a colored sketch that shows your "new and improved" appearance for this animal. The animal should appear in its ecosystem.

5. Briefly look at the descriptions of the other habitats. The dogs began as a single species but they were then reproductively isolated. What effect do you think this had on the individual populations on each island after 800 years.

6. Explain how the adaptations and evolution of this species is influenced by the number of dogs that were introduced to the island. In other words, how does genetic variation affect a species ability to adapt to a changing environment?

7. How are the forces of natural selection different than selective breeding of dogs and the practices used in agriculture?

8. What role does mutation and recombination play in the evolution of this species?

9. How would the evolution differ if this were an asexually reproducing bacteria instead of a sexually reproducing mammal?

10. Is this modern animal still a *Canis pedatus?* Defend your answer based on the definitions of a species.