WHO'S YOUR DADDY?

Research Area: Conservation Genetics

Background: Black Howler Monkeys (*Alouatta caraya)* are native to the tropical rain forests of southern Brazil. They are the largest species of primate in the New World

with their height ranging from 22 to 36 inches and their weight from 8 to 22 pounds. They are canopy dwellers, rarely coming to the ground. They communicate by loud penetrating sounds that give rise to their name. In fact, they have the loudest call of any primate. Color is sexually dimorphic in Black Howler monkeys. Only adult males exhibit the characteristic black color. Females and juveniles are lighter brown. Howler monkeys are vegetarians with a primary diet of leaves, fruit and an occasional insect. Over the last few decades, hunting and habitat loss have significantly reduced the number of Black Howler monkeys in the wild. The plight of the species has been recognized by international conservation agencies who recently were successful in having the species listed as endangered by the United Nations (*Convention on International Trade In Endangered Species – CITES)*.

Scattered groups of Black Howler monkeys exist in captivity throughout the world. Several facilities, including the Pittsburg Zoo, have begun breeding programs in hopes of providing animals to return to the wild. Captive breeding is challenging with this species because social interactions play an important role in initiating reproductive cycles of females. Isolated pairs rarely produce offspring. Much better success occurs when the animals are allowed to form larger social groups. While important for the reproductive state of the monkeys, free-ranging social groups makes documentation for pedigrees difficult. A typical example of this problem occurred at the National Zoological Park. Nine adult Howler monkeys were introduced into a new designed rain-forest enclosure. The monkeys quickly formed two female-centered groups and reproduction began. The population has grown quickly and park biologists have initiated a cooperative plan to re-introduce monkeys to a new National Park in Brazil. The biologists would like to insure that the monkeys being released are not closely related sibs. Unfortunately, they have no pedigree data but they do have a substantial amount of behavioral information. From their studies, they know that the female named Prissy has produced four young. Most of the time, Prissy is observed in close association with a dominant male named Bill-Bo. On several occasions, at intervals that would correspond with approximate insemination dates, she has been observed to be interacting with two other males, Freddy and Grumpy. It is unclear from the observation data which, if any, of these males fathered the four offspring.

Information and Data:

You have been contacted to help determine the relationships of the four juvenile Howler monkey so that the most appropriate individuals can be selected for the reestablishment experiment. Basic Mendelian rules are all that you will need to help provide useful information.

- You are provided with DNA samples from the four offspring, Casper, Sammy, Rose and Lil Abner
- Prissy is known to be the mother of all four of these offspring
- DNA samples from all three punitive fathers, Bill-Bo, Freddy and Grumpy is available
- Your laboratory has the capability to determine genotypes at six microsatellite loci. All of the loci exhibit co-dominant modes of inheritance. Some of the locus will be informative, some may not. You may use as many or as few loci as you feel are necessary.

Assigment:

1. Use the *ELS* program to collect genotype data from each of the 8 individuals. Be sure to carefully record the sample identification information on the **Electrophoresis Loading Sheets** and the genotypes on the **Genotyping Data Sheet.** Your data set is called *Monkey Data.*

2. Before examining the data, propose a hypothesis for one possible outcome of your investigation. Based on this hypothesis, state a prediction and an alternative that will allow you to answer the investigator's question.

Hypothesis:

Prediction 1:

Alternative:

3. As a starting point, assume that Bill-Bo is the father some of the offspring. Based on the genotypes of Bill-Bo and Prissy, what genotype patterns are possible for their children?

4. Examine the full data set. Do the genotypes of the four offspring indicate that they all have the same father? If so, who is the father? If not, who are the fathers of each individual? Can you refute either your prediction or the alternative? Carefully consider the logic that you use. Remember that alleles that can exclude samples are more "powerful" than those that are shared.

5. Of the four offspring, which two would your recommend being released together?

6. Using the word processor on your computer, write a report (see Report Format instructions) outlining your investigation, describing the results and providing your conclusions. Be sure to include careful statements about the logic that led you to your decision.

7. Submit your report and your worksheets to your TA.