

Name: _____ Date _____

EEB/ANTH 4329: Primate Ecology and Social Behavior

Lab 1: Computer Models of Foraging Behavior

Many explanations of primate grouping patterns focus on the distribution and abundance of food resources. In this lab, we will use a computer simulation to test some hypotheses regarding how food distribution affects the evolution of primate societies.

We will be using this simulation for a total of three labs. Today's lab will serve as an introduction to the model world. We will examine how differing distributions of food affect group size.

1. Download NetLogo onto your computer if you haven't done so already. Double click on the icon to start the program.

2. Download the Primate Ecology Lab Model from Canvas.

3. Open the Primate Ecology Lab Model from NetLogo.

4. Spend some time with your lab partner(s) familiarizing yourselves with the simulation. Many of the settings can be changed by entering numbers or by clicking on slides and moving to the left or right to change the value of the setting.

3. Click on **setup** to initiate the model. NetLogo will prompt you to load a text file, which is the primate's digital chromosome. This chromosome determines whether the primate's **predisposition** is either **solitary** or **social**. Once you have loaded the appropriate text file, click on **go** to run the model.

Click on **go** again when you wish to end the simulation.

The world contains a variable number of square cells of food. Cells with more food are darker green; cells with less food are lighter green; and cells with no food are very pale green.

The primates are modeled as sexually reproducing diploid organisms. They are depicted as colored shapes, circles for females and triangles for males. The color refers to the individual's group membership. Like baboons, the females display their reproductive status visually, though in this case they use letters: C = cycling, O = ovulating, P = pregnant, L = lactating. Infants start out small and light in color. Once they grow to adult size they darken to adult coloration.

Each time step ("tick") of the simulation, the primate assesses the surrounding area, and makes a decision about where to move, in order to maximize its access to food and mates while minimizing its risk of encountering hostile conspecifics. Primates use energy to move and reproduce, while they gain energy from feeding. If a primate runs out of energy it dies.

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Primates may disperse once they reach sexual maturity. The probability of dispersal is an inherited trait, with separate values for different life history stages and sexes. So, both sexes aren't binary in their dispersal but along a spectrum. If chance allows an agent to disperse, it is given a different group affiliation.

Once female primates reach their age at maturity, if they have enough energy and if they have access to mates, they begin to reproduce.

When primates fight, the loser loses energy, based on the *cost-per-attack* parameter.

If a primate reaches its maximum life expectancy it dies even if it has plenty of energy. Each primate's life expectancy is fixed by its genes, that is, each agent inherits the value of the tick at which it will die. This value, however, can evolve over time. And of course, this only relates to intrinsic mortality. Agents can also die from being attacked or starving or whatever.

5. Settings

This model contains many settings that can be changed. For the purposes of today's lab, we will focus on food distribution and abundance, which is controlled under Patch Settings. The other settings will be fixed. To get a sense for how it works, set the following settings to those listed on the table below and let the model run for a few minutes.

initial-number-of-groups	5
Initial-group-size	8
Patch Settings	
patch-count	30
patch-radius	2
patch-growth-rate	5
patch-max-energy	100
Primate Settings	
food-eaten-per-step	30
cost-per-bmr	10
cost-per-unit-step	2
cost-per-growth-unit	15
cost-per-attack	20
Predator Settings	
Predator-size	0
Initial-predator-count	0
Alarm-calls?	OFF

6. Discuss with your lab partners some hypotheses for how food abundance and distribution relate to primate social behavior.

patch-count: The number of distinct food patches in the world.

patch-radius: The radius of the patch, in cells.

[illegible]

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Lab Report (due before the start of your next section meeting): Write a short (4-5 page) lab report detailing your findings. Lab reports need to be formatted as follows: typed, 12-point font, Times New Roman, double-spaced, 1" margin. Include your name, date, and section number at the top of each page.

This lab report should include the following sections:

Introduction: Briefly stated, what were the goals of your study? What is/are your hypothesis(es)? What is/are your prediction(s)?

Methods: What methods did you use in your study? This section doesn't need to be long, but should concisely describe what you did. A good methods section enables a reader to replicate your study. Make sure to include all relevant information regarding what model you used, what the parameters values were set to, and how the simulations were run.

Results: Summarize your data! What did you find? What patterns of behavior did you see in each model? What differences did you observe in the different models?

Conclusions: This is where you discuss the results of your study, relating your findings to the goals stated in your introduction, and discussing the implications of your findings for broader questions in the field. In this section, you should address the following questions (in addition to any other questions you think are relevant to include):

1. Were these results consistent with your prediction(s)? Why or why not?
2. Do you think your results can help explain the behavior of real primates?

Works Cited: Please provide the complete bibliographic data for any works cited in the body of the report, using a standard format, such as the following:

Altmann, J. (1974). "Observational study of behavior: Sampling methods." *Behaviour* 49: 227-267). Remember to cite the model!

Appendix: Include a copy of your filled-in results table. Like before, this can be included as a scan, digital photo, or retyped document, for example.