Name: _____ Date_____

EEB/ANTH 4329: Primate Ecology and Social Behavior
Lab: 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, and 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 Moodle (or if that is not working, as your TA to email it to you!).

3. Open the Primate Ecology Lab Model from NetLogo.

4. Spend some time with your lab partners familiarizing yourselves with the simulation. Many of the settings can be changed by entering numbers or by clicking on slides and moving the left or right to change the value of the setting. Once you have the desired settings, click on **setup** to populate the world with virtual food and primates, and click on **go** to start the simulation.

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

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

The primates are depicted as colored shapes, circles for males and triangles for females. The color refers to the group in which the individual was born. The simulation can be set so that either males or females (or both or neither) disperse from their natal group at maturity.

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 or predators. Primates use energy to move and reproduce, while they gain energy from feeding. If a primate runs out of energy it dies. If a primate reaches its maximum life expectancy it dies even if it has plenty of energy. Once female primates reach their age at maturity, they begin to reproduce, if they have enough energy and if they have access to mates.

5. Fixed 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. Once you've played around with the model for a few minutes to familiarize yourself with how it works, set the following settings to those listed on the table below:

Group settings		Life History	
initial-group-count	50	age-at-maturity	25
initial-number-males	1	life-expectancy	400
initial-number-females	1	Dispersal	
Primate Settings		female-transfer?	Off
Energy Costs & Gains		male-transfer?	On
max-energy	660	Weighted Strategies	
birth-cost	240	home-weightedness	4
food-eaten-per-step	32	food-weightedness	5
energy-cost-per-step	6	conspecific-weightedness	6
aggression-cost	18	male-weightedness	6
Evolving Traits		predation-weightedness	7
ave-fighting-ability	0.5	Predator Settings	
ave-intragroup-tolerance	0.5	play-alarm-calls?	Off
ave-intergroup-tolerance	0.5	predation-rate	0
female-female-tolerance	0.5	predation-duration	0
female-male-tolerance	0.5	predation-cost	0
male-male-tolerance	0.3		
male-female-tolerance	0.9		
perception-range	2		

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

patch-abundance: A measure of how many of the world's patches start off with any food in them. Varies from 0 to 1.
patch –patchiness: The degree to which patches are clustered together versus evenly distributed. Varies from 0 to 1.
patch-growth-rate: The rate at which food in patches regrows after being eaten. Varies from 0 to 10.
patch-max-energy: The maximum energy per patch. Varies from 0 to 100.

7. Develop a hypothesis that relates to one of the following four parameters: patch-abundance, patch-patchiness, patch-growth-rate, and patch-max-energy.

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8. State your hypothesis here:
Hypothesis (2 points): _____
_____
_____
_____

9. Now, test your hypothesis, using three different models, with three runs of each model. Design your models so that you can isolate the effects of varying a single parameter. What do you predict will happen?
Prediction (1 point): _____
_____
_____
_____

10. Now run the models and record your results in the table below. (3 points)
Some model runs may end quickly if all the primates die off. Other model runs may continue indefinitely but become increasingly slow as the number of primates increases and requires more computational effort per time step. Run each model for at least 150 or so ticks if you can.

Model	1			2			3		
Trial / Parameter	1	2	3	1	2	3	1	2	3
Patch-abundance									
Patch-patchiness									
Patch-growth-rate									
Patch-max-energy									
Ticks at end of simulation									
Average group size									
# Primates									

11. Were these results consistent with your prediction? Why or why not? (2 points)

12. Do you think your results can help explain the behavior of real primates? (2 points)