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EEB/ANTH 4329: Primate Ecology and Social Behavior
Lab: Computer Models of Social Behavior

Last week we used the NetLogo computer model to explore some aspects of how food distribution affects the evolution of primate societies. Today we will continue using this model to explore some aspects of primate social behavior.

1. 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:

Patch settings		<i>Life History</i>	
Patch-abundance	0.5	age-at-maturity	25
Patch-patchiness	0.5	life-expectancy	400
Patch-growth-rate	5.04	<i>Dispersal</i>	
Patch-max-energy	50	female-transfer?	Off
Primate Settings		male-transfer?	On
<i>Energy Costs & Gains</i>		<i>Weighted Strategies</i>	
max-energy	660	home-weightedness	4
birth-cost	240	food-weightedness	5
food-eaten-per-step	32	conspecific-weightedness	6
energy-cost-per-step	6	male-weightedness	6
aggression-cost	18	predation-weightedness	7
<i>Evolving Traits</i>		Predator Settings	
ave-fighting-ability	0.5	play-alarm-calls?	Off
ave-intragroup-tolerance	0.5	predation-rate	0
ave-intergroup-tolerance	0.5	predation-duration	0
female-female-tolerance	0.5	predation-cost	0
female-male-tolerance	0.5		
male-male-tolerance	0.3		
male-female-tolerance	0.9		
perception-range	2		

2. Last week we focused on just two outputs of the model: average group size, and total number of primates. As you may have noticed, the model has quite a few other panels that provide information about the model. These include the following:

Evolving Traits: Most traits in the model are fixed (like the Patch Settings) but seven traits are allowed to evolve: **fighting-ability** and the degree of **tolerance** among individuals in different sex classes (**female-female-**, **female-male-**, and **male-male-**, **tolerance**) as well as **intra-group-tolerance** and **inter-group-tolerance**. In these models, tolerance influences two things: the probability that an individual will move into a given patch

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(individuals seek out those they tolerate but move away from those they don't tolerate) and the probability that an individual will start a fight with another individual. The starting average conditions of **tolerance** are set in the Evolving Traits panel – these set the mean values, around which individuals vary. This model uses blended inheritance, in which the value of a given trait for the offspring is the average of the value of the individual's mother and father. (This is unrealistic for traits determined by a single locus but is similar to how traits affected by many genes, such as height, are transmitted.)

If tolerance setting affects individual reproductive success, then the average tolerance level will change, as shown by the lines in the **Evolution of Tolerance** panel.

For output displayed as lines, placing your cursor directly over the endpoint of the line will cause the numerical value of that point of the line to be displayed.

3. Group size and composition – the number of males and females in a group – are key variables in socioecology. Today we will focus on varying the starting number of males and females per group, and let the model run long enough to get some sense for whether there is an evolutionarily stable number of males and females per group,

In the models, males and females need to find mates to reproduce. Males and females also compete with male and female members of their own group for food, and males compete with other males for mates. Individuals lose energy points when they lose a fight, and if they lose too many energy points, or don't get enough food to eat, they die.

To explore the effects of initial group composition on survival of males and females, design three models with different starting compositions (different number of males and females). Design the models to isolate the effects of male:female ratio: each model should therefore include the same total number of individuals per group.

Indicate your model design here (**1 point**):

Model	initial-number-females	initial-number-males	group size (males+females)	male:female ratio
1				
2				
3				

4. Which of these models do you predict will result in the best rates of survival and reproduction, and why? (**1 point**)

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5. Which of these models should favor the evolution of greater fighting ability, and why? **(1 point)**

6. Which of these models should favor the evolution of increased tolerance? Which category or categories of tolerance, and why? **(1 point)**

7. Now run the models and record your results in the table below. **(3 points)**
 As before, 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, but if it's going very slowly, you can stop sooner if necessary.

Model	1			2			3		
Trial	1	2	3	1	2	3	1	2	3
Parameter									
Initial-group-count	10	10	10	10	10	10	10	10	10
Initial-number-males									
Initial-number-females									
Ticks at end of simulation									
Average group size									
# Primates									
# Males									
# Females									
Fighting-ability									
Inter-group-tolerance									
Intra-group-tolerance									
Female-female-tolerance									
Female-male-tolerance									
Male-male-tolerance									

8. Were these results consistent with your predictions? Why or why not? **(3 points)**