Extinction 2, a game that examines important concepts in evolutionary ecology

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For Instructors' Benefit **The game can be ended at any time, but students are only awarded a unique receipt after 7 rounds of play.**

Questions

Students have been asked a variety of questions about what they have learned from the game.

Examples

Why do you suppose the inventor of Extinction made reproduction and environmental change required moves?

Competition in Extinction is a numbers game, with the least numerous species always outcompeted by the more numerous neighboring species. Is this always the case in nature?

Competition is considered by biologists to be a negative relationship for both species involved. Why is competition not considered a + , - relationship like predation with the superior competitor considered to benefit from the relationship?

Why are numbers important in determining the species surviving a competitive event in Extinction but not an episode of predation? In nature are not prey usually more numerous than predators?

Why are larger populations made more susceptible in Extinction to famine, pestilence, drought and cold?

Why do you suppose certain species are not able to defend themselves against certain man-made changes such as the draining of swamps? How realistic is this assumption?

Examples of students' answers

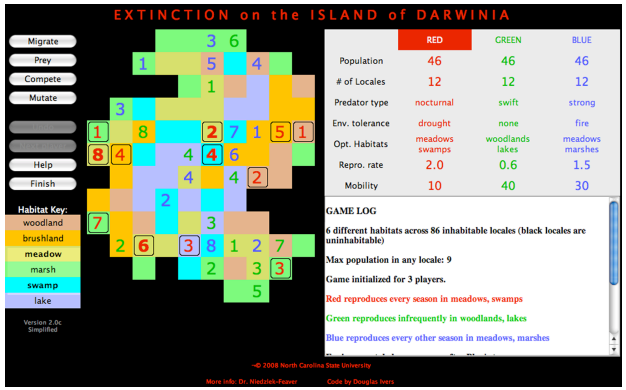
Winning or losing

My species did not win the game. Through 7 rounds, it could not keep up with the reproduction rate of the red species. However, if the game continued, I believe the successful reproduction of the red species would decline due to limited resources, especially as competition would increase among the three species. So over time, my species could have continued to increase.

I didn't cause any of the other species to go extinct because the game was so short but I did have the highest population at the end. At first I focused on trying to decrease the numbers of the other 2 species by competing. After a round or 2, I decided it was more beneficial for me to focus on getting more of my species in the optimum habitat squares. Since the board was so open, I had no trouble getting more of these squares and this allowed me to reproduce with higher numbers.

My species had the highest reproductive rate initially, so my strategy was to migrate as much as possible, especially to my optimal areas. This allowed my population to increase more rapidly than the others and continue to spread out to new areas.

The controversy over gaming in the classroom continues. Do students simply remember aspects of the game such as their pieces, or do they "learn" the embodied concepts? We have developed an on-line game based on Extinction, a board game popular among our students. More importantly, most instructors felt students after playing the game better retained and understood important evolutionary ecological principles about community relationships.



In Extinction 2, species battle to survive on the island of Darwinia. Darwinia is divided into several habitats. Any species can migrate into a habitat and compete with or predate on neighboring species, if they are dealt the proper "genetic profile" to do so. Infrequently, moves will allow a species to change genes, but since the direction of mutations are unpredictable, a predatory species may suddenly become their neighbors' favorite prey.

Game controlled events

Reproduction Reproduction can take place only in the optimal habitats named in a species profile.. The game announces each time that each species reproduces and keeps count of the number of individuals in each species.

Environmental disasters As in any ecosystem, environmental change sometimes occurs. When this happens, the game announces the type of disaster and how many of a species have been killed. As in the real world, larger populations are at greater risk.

Player controlled moves

Migrate Move to any empty square (or one occupied by your own species) within your mobility range

Prey Move to an adjacent square containing another species: if the prey is appropriate, only one of your individuals can consume all of the prey in the square. But some species cannot be eaten by your type of predator--they may be camouflaged or able to outrun you.

Compete Move to an adjacent square containing another species: the number of individuals that you move must be greater than those in the square to out-compete them (your species will then replace the other population in that square).

Mutate genes Genes can be changed. This is a good move for a species dealt a bad profile. Imagine a species who at the beginning of the game has a migration potential of zero and only found in habitats where it cannot breed. The player will have to give up a turn interacting with other species and the resulting changes can better or worsen the profile.

Examples of students' answers

Effects of mutation

After the mutation I had greater success in competing because my reproductive potential increased.

After the mutation, my reproductive rate slowed down but my migration rate increased, allowing me to move large groups over greater distances.

My species did better. The nocturnal predator type improved my ability to predate other species that were not defended against that predator type but were defended against my initial predator type.

What type of organism were you if you were a vertebrate?

At the beginning of the game, my species was some sort of strong predator who lived in woodland and brush areas. It had a moderate mobility (20) and moderate reproduction (1.0). This could describe a bear who is a strong predator that can cover a fair amount of geography. Also, it has one or two cubs per year and the mother takes great care of her cubs - a k-selected attribute. Though mutation, my species became a "crafty" predator with an increased reproductive rate of 2.0, but a decreased mobility of 10 that preferred swamps. I thought this could be an animal such as a fox who covers a much smaller territory than a bear, uses guile in its predatory technique, and has more cubs at one time.

The first animal was k-selected because the size of the population remained fairly stable and would have stayed at the carrying capacity if I didn't move them around a lot. This animal did not reproduce often and had a small amount of offspring. The second population was r-selected because it reproduced quickly in an ideal environment. Almost as soon as organisms were moved, more offspring filled the capacity of the space.

My species might have been a rodent based upon its reproductive rate, and mobility. It is r-selected based on the high reproductive rate. My mutated species might be a reptile because of its breeding area and resistance to drought. It could also be a bird based upon its predation type and breeding environment. The mutated species also seems to be r-selected based upon its reproduction rate.

Instructors have also had students investigate by searching the internet for a good match, what living or fossil organism, or plant, or invertebrate, their Darwinia species most resembled.