



*A card game about populations
by Jack Suss & Chris Pastore*

The Red Queen's Menagerie is a card game that explores the Red Queen Hypothesis from biology. Parasites encounter Hosts and some survive depending on their traits. This game simulates fluctuations in populations over time.

<https://sites.philau.edu/pastorec/rqm>



Objective

To have your selected species be the most successful species to survive the game.

Also, track the survival of the different species over time.

Components

Host card deck, Parasite card deck.

Blank graph for keeping score:

<http://sites.philau.edu/pastorec/rqm> to download and print full page score sheets.

Setup

Two players will each have a deck of cards. The person who was most recently ill is the Host (gray backs, *Plithi spp.*), the other is the Parasite (red backs, *Comedento spp.*). Each player shuffles their deck and draws 8 cards. The remainder of the cards is your Reserve Pile.

After looking at your hand, record on the score

pad the number of each species in your hand.

Next, choose a species that you think will “win” (has the most sum total individuals at the end of the game). Players should decide if both of them will announce their choice at the start of the game or at the end. At the end of the game, compare the sum total number for each species. If your species had the most individuals you win. It is possible for both players to win or lose.

Playing the Game

1: Host-Parasite Encounter Phase

In the Encounter Phase, one player chooses and plays a card face up, the opponent chooses and plays a card against it. In the first encounter of each round, the Host goes first. In each successive encounter, the player who survived the previous encounter plays first.

When the species have traits that match, the Parasite wins (matching genotypes). *Return the Host card to the Host's Reserve Pile, keep the Parasite*

card on the table for the Reproduction phase.

When the species do not match traits, the host wins. *Return the Parasite card to the Parasite's Reserve Pile, keep Host card on table for the Reproduction Phase.*

This constitutes one Encounter. Repeat until all 8 cards have been played.

2: Reproduction Phase

At the end of the Encounter Phase, there will be 8 surviving cards, some Hosts and some Parasites. They will now reproduce.

Each successful host makes 2 offspring and dies: *For each Host card surviving, add one card of the matching species from your reserve pile to your hand (for a total of two cards of the same species).*

Each successful parasite makes 3 offspring and dies: *For each Parasite card surviving, add two cards of the matching species to your hand for a total of three cards of the same species.*

There are only 9 cards of each species. So it is

possible that you will not have enough cards to reproduce. In this case, there will be **mutations**. If you do not have enough cards of the required species to reproduce, shuffle your reserve pile and randomly draw cards to satisfy the number of offspring required.

If the host has zero cards after reproduction, both players lose!

3: Carrying Capacity Phase

Each player needs 8 cards for the next turn. From the offspring that were generated in the Reproduction Phase, each player should draw 8 cards. *If you have fewer than 8 cards, shuffle the Reserve Pile and randomly draw until you have 8.* Think of this as **immigration**.

If you have more than 8 cards, shuffle your hand and randomly discard down to 8. Think of this as **carrying capacity**.

4. Recording:

Look at the 8 cards you now have, and record the number of cards of each species on the provided score sheet. Start a new round.

Winning and Losing the Game

A game lasts 10 rounds. At the end of the game, each player adds the number of individuals from each round of play.

If the declared Host species has the most individuals of any Hosts, the Host wins. If the declared Parasite species has the most individuals of any Parasite, the Parasite wins.

If the host has zero cards after Reproduction, **both** players lose!

Strategy Tips

The Parasite player will often choose to match in the Infection and Selection Phase, although longer term strategy might require some species leaving the population and an intentional loss could be

beneficial. The Host player will want to carefully choose which card to play at what time, trying to draw out Parasites that will favor future generations of Hosts.

Alternate Rules

Play more rounds to see more fluctuations.

Doing the Science

This game is intended as a fun way to demonstrate complex population behavior in a community. To explore this, after the game, make a graph of your data. Plot round number versus the population of each species (you can use the graph paper provided on the website <http://sites.philau.edu/pastorec/rqm>).

Overlay the parasite and host graphs to look for patterns of population fluctuations. Why do the graphs look the way they do? Can you see the Red Queen's Hypothesis at work?

Credits

The following people made this game possible.

Game Concept:	Jack Suss Chris Pastore
Artwork:	Diamond Braxton
Play Testers:	Josh Pierce Mike Bastady

Our game is a modification of Gibson, A. K., D. M. Drown, and C. M. Lively. 2015. "The Red Queen's race: an experimental card game to teach coevolution". *Evolution: Education and Outreach* 8:10.

Legal

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