



# "Bateman's Principles: Reproductive Behavior and Replication in Science" Classroom Activity Guide

Season 2, Episode 10

## Overview

This classroom activity guide complements Season 2, Episode 10 in which Amy speaks with Zulema Tang-Martinez. This episode addresses individual recognition, sex differences in mating behavior, challenging widely accepted scientific principles and the value of diversity and inclusivity in the scientific community.

This accompanying classroom activity guide focuses on **investigating the evidence for sex differences in mating behavior and sexual selection**. This guide includes three activities which address the key concepts and student learning targets described below.

This resource is designed to be flexible and adapt to your specific course. We provide three classroom activities. Each activity can stand-alone, the activities can also be mixed and matched with each other, or these activities can be integrated with your existing materials. These materials are designed as adaptable and editable starting points, feel free to make the changes necessary for these to be useful in your specific classroom.

## Key Concepts

- Bateman's principles provide a framework for understanding reproductive behavior
- The evidence supporting Bateman's principles is mixed, both within and between species
- Replication is a valuable part of the scientific process

### Content Note

The concepts addressed in this Activity Guide may be sensitive, especially for students with less traditional sex or gender roles. We encourage you to consider how to best implement these activities to ensure these (and all) students feel safe, welcome and valued. Consider consulting published resources like [this article](#) as you work to promote an inclusive biology classroom.

## Student Learning Targets

- Articulate Bateman's principles and their implications for sex differences in reproductive behavior (Activity A)
- Examine evidence supporting and challenging Bateman's work (Activity A, B)
- Read and discuss a review article (Activity A)
- Recognize the value of replication studies in animal behavior and biology more broadly (Activity A, B, C)

## Prior Knowledge

Before beginning these activities, students should:

- Complete any "Before Class" exercise described in the activity
- Be able to compare and contrast the terms 'sexual selection' and 'natural selection' (for activities A and B)

# Activity Option A - Guided Reading and Discussion

## Target Audience

- Undergraduate students in an animal behavior or behavioral ecology course

## Description

This activity is centered around reading a review article. The article describes Bateman's principles, his original experiments and the cultural climate in which they were developed, as well as further evidence supporting and challenging his conclusions.

## Materials Needed

- Copy of "[Rethinking Bateman's Principles: Challenging Persistent Myths of Sexually Reluctant Females and Promiscuous Males](#)" by Zuleyma Tang-Martinez.
- Copy of Active Reading Guide Worksheet (available as a Microsoft Word document in Learning Activity Downloads, edit as needed for your classroom)

## Implementation

### *Before Reading*

- Introduce students to the topic of sexual selection and reproductive skew. This could be done through your existing lecture materials, a textbook reading, and/or by playing 06:47-15:07 of Season 2, Episode 10 of the Animal Behavior Podcast
- Decide if you want your students to discuss the reading in your next class period. If so, you may want to break them into groups and assign different portions of the reading to different groups (See Part 4 on the Active Reading Guide Handout)

### *During Reading*

- Ask the students to take notes using the Active Reading Guide handout. Feel free to edit this handout to make it reflect your teaching style and goals.

### *After Reading*

- You could have the students turn in their reading guides and you could grade them for completion or correctness.
- You could use the reading guide to facilitate a class discussion.
  - If you assigned different portions of the readings to different groups, you could use the "jigsaw" technique (an overview of the jigsaw technique can be found [here](#)) to have students teach their portions of the paper to the rest of the class.
  - You could present Figure 1 from the paper and ask students to explain it and then share their responses to the table in Part 3 of the Active Reading Guide.

# Activity Option B - Warm Up

## Target Audience

- Undergraduate students in an animal behavior or behavioral ecology course

## Description

This is a quick activity designed to pique students interest and get them thinking about how and why reproductive output might vary between the sexes.

## Materials Needed

- Projector and slide (slide available on google slides [here](#), make your own copy for editing)
- Blank table handout (optional; available in Learning Activity Downloads)

## Implementation Suggestions

### *Before Class*

- No pre-class work, this is designed to be an introduction to the topic

### *During Class*

- Show the slide with the blank table and possible numbers - ask the students to place the numbers in the cells that they think make the most sense. Give them just a few minutes to do this. You can give them a blank copy of the table to fill out or just have them make their own notes
- Ask students to compare with their partner -- where are their numbers the same and where are they different? What information did they use to make decisions about where to place these numbers?
- Show the correct answers
- Ask students what surprises them the most, and why?
- This should provide a nice transition into discussing Bateman's principles.

### *After Class*

- Optional: After discussing Bateman's principles you could come back to this table and point out how the maximum number of offspring produced in a lifetime is similar for male and female kittiwake gulls. You could ask students to investigate this system and develop a hypothesis that explains this observation as homework. Note: Kittiwake gulls are monogamous.

# Activity Option C - Replication and Reproducibility Jigsaw Activity

## Target Audience

- Undergraduate students in any introductory science course

## Description

The goal of this activity is that students will work together to understand and evaluate the causes, consequences and potential solutions to the replication crisis in science. This will be done through a [jigsaw approach](#), where students break into groups and evaluate different source material, then form a second set of groups with students who read different material. For this activity to be effective, students need to be prepared and able to trust that the other students in their group have completed their assigned tasks. This activity will require students to complete 'homework' before coming to class.

## Materials Needed

- At least four articles/videos about the "reproducibility crisis" and the value of replication, a curated list can be found [here](#) or feel free to use your own
- Note Taking Handout (available as a Microsoft Word document in Learning Activity Downloads, edit as needed for your classroom)
- In Class Handout (available as a Microsoft Word document in Learning Activity Downloads, edit as needed for your classroom)

## Implementation

### *Before class*

- Break students into groups and assign each group one of the "Reproducibility Resources" listed above
- Make sure the students know that they will be responsible for teaching the content of their resource to the other groups - encourage them to take their job seriously and take careful notes about their resource. You can give them the Note-Taking Guide worksheet to facilitate this

### *During Class*

- Have students first meet in their "Home Groups" of students who all viewed the same resource. In this group, they should come to an agreement about the main points of their resource complete Part 1 of the In-Class Worksheet. While students are in their home groups, have them "number off" so that each student in a single home group has a unique number, but those numbers are repeated across groups (so if your home groups have 4 students, each student in the class should get a number of 1 thru 4).
- Then, have students move into new groups, according to the number assigned in their Home Group (e.g., all the "1s" in one group, all the "2s" in another group). These are their "Expert Groups" - each expert group should be made up of students who viewed different resources. This group reassignment can be logistically intimidating, but it is very doable - it helps to give it some thought ahead of time, based on your class size. In these "Expert Groups" they should complete Part 2 of the In-Class Worksheet.

### *After Class*

- Consider wrapping up this activity with a short reflective writing assignment or 'exit ticket' tailored to type of students in your classroom. In a class of biology majors, for example, you may ask them what practices they will take in the lab to help ensure the reproducibility of their research. In a class of non-science majors, you may ask them how/if knowing about the reproducibility crisis will affect they way they interpret headlines about scientific discoveries.