##### **Objectives**

Students will learn how counting butterflies can improve precision of abundance estimates. These table activities are extremely fast-paced, and the table can be visited with a handful of students simultaneously and students should not spend more than 5 minutes at any one table. The activity should start with a brief background of the Zipkin Lab, followed by short instructions when the students approach the table. Next, the students spend 1-2 minutes searching the room for butterflies. The activity closes by adding the data to a googlesheet and updating the model results. The take-home message is “with more people counting butterflies, our abundance estimates get more precise!”

#### **Introduction *(1 minute)***

* When students first arrive at the table give a quick introduction about the lab and activity. Here is an example script: “My name is Mike, and I study butterflies and this is Bruna, and she studies birds. We are both members of the Zipkin Quantitative Ecology Lab and we are interested in using math to understand how many animals there are on a landscape and how the number of animals are changing over time. One important data source we use to know how animal numbers are changing is data collected by the public. And today, you can help us estimate how many butterflies are in this room. As you can see (point to a butterfly), there are several butterflies scattered throughout the room, and we need your help to understand how many there are. Would you like to join our butterfly count?
* If yes, the students will:
  + 1) sign in with their initials and start time
  + 2) grab a clicker and note it on the sheet

**Count! *(1-2 minutes)***

* Instruct students that they have 1-2 minutes to go about the room and count as many butterflies as they can find
* When students return, complete the worksheet, documenting:
  + Name of observer
  + Number of butterflies seen
  + Time spent looking
* Have the person in charge of running the model add the information to the google sheet and re-run the model to generate a new figure showing the prediction of number of butterflies (ideally with smaller confidence intervals)

**Conclusions *(1 minute)***

* Highlight how their efforts made for a more precise estimate
* Highlight how more people documenting nature better helps us understand how animals are doing in the wild
* Let students choose a sticker to keep

**Supplies:**

1. Small poster board easel to hold poster on table
2. Poster with instructions (currently this is printed on a small poster, but it could be increased in size for future events)
3. 3-D butterflies to hide throughout the room. We used 80 butterflies to hide throughout the room and that number worked well
4. Clickers for use counting butterflies
5. Sign-in sheet to keep track of effort, which is the one parameter in the model. In the past we had students write their name, start time, end time and total effort. In the future it might be quicker for students to simply write initials, start time, and then calculate an effort based on the start time
6. Laptop with R installed to run model
7. Second monitor to display updated results of model (R graphical output) and on the second half of the second monitor the poster with instructions is displayed.
8. Insect stickers to give out to students after completing the task
9. 2-4 volunteers (less than 2 would be difficult)

**Set-up:**

1. Place easel and poster with instructions on one side of the table
2. Place laptop and second monitor on other side of table
3. Have an initial 5 surveys (can be made-up data) on the google sheet to make sure the first students can see how their efforts are improving the overall estimates
4. Set-up the second monitor to display poster with instructions on one side of the screen and the results of the abundance model estimate on the other side of the screen
5. Place butterflies throughout the room. Don’t worry too much about being cheeky with the hiding. Students will not be all that close to finding all of them
6. Make sure R-script is running successfully from source
7. Remove some counts if the effect of having more observers is no longer creating more precise estimates