**Investigation: How Do Biologists Estimate Population Size?**

**Objective**: You will be expected to estimate the size of a sample population using the mark-recapture technique and compare the mark and recapture technique to other methods of population estimating.

1. You are given the responsibility of determining the number of fish in Horseshoe Lake. Discuss with your partner how would you accomplish this task and describe in detail below.

|  |  |  |
| --- | --- | --- |
| Trial Number | Number Captured | Number captured with mark |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |
| 9 |  |  |
| 10 |  |  |
| Total: |  |  |

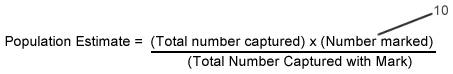
**DATA**

**Mark and Recapture Technique**

In this procedure, biologists use traps to capture animals and mark them in some way.  The animals are then returned unharmed to their environment.  Over a period of time, the animals are trapped again, with researchers recording how many of the original tagged individuals are recaptured.   The **ratio** of animals trapped with the tags and the animals trapped that were not tagged is used to estimate the overall population number.

**Procedure:**

* Obtain a bag that represents your community
* Capture 40 “animals” by removing them randomly from the bag with your sampling device (scoop)
* Place a “mark” on them by replacing them with 40 brightly colored plastic beads
* Leave the 40 marked “animals” aside after “marking” (replacing them with colored beads) them
* Without looking, use a scoop to **recapture** animals in the population.  Record the number of “animals” recaptured in total and the number that have a mark on them on the data table
* Return the “animals” to the bag and repeat ten times.
* Remove the “marked” beans and replace them with the original “unmarked” animals.

4. Calculations = Find your Population Estimate by showing your work below.  


**40**

Estimated Size \_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Trial Number | Number Captured | Number Recaptured with mark |
| 11 |  |  |
| 12 |  |  |
| 13 |  |  |
| 14 |  |  |
| 15 |  |  |
| 16 |  |  |
| 17 |  |  |
| 18 |  |  |
| 19 |  |  |
| 20 |  |  |
| New Total: |  |  |

7. **Continue** the experiment by filling out the data table.   
Recalculate your estimate using the formula for all 20 trials. (**Show work below)**

a. Is the 20-trial estimate different than the 10-trial estimate?

b. To get the most accurate results, you would generally conduct [ more / less ] trials . (circle)

8.  Given the scenario and data below, what would be the estimated size of a butterfly population in Wilson Park?

A biologist originally marked 40 butterflies in Wilson Park.  Over a month-long period ­ butterfly traps caught 200 butterflies.  Of those 200, 80 were found to have tags.  Based on this information, what is the estimated population size of the butterflies in Wilson Park?     **SHOW WORK**.

9.  He later does another capture exercise at the community garden near the high school.  In this area, he captured and marked 40 butterflies.  The traps in this location found 100 butterflies where 50 of them had tags.   What is the population size of the butterflies at the school?  **SHOW WORK.**

10.  The department of natural resources regularly collects data on population numbers in states.   Discuss reasons why population numbers would be important and how this data could be used to manage wildlife populations in the state.